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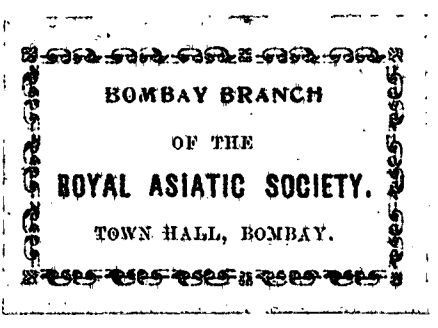
Indian Central,
Annual report,
1928 - 1932.



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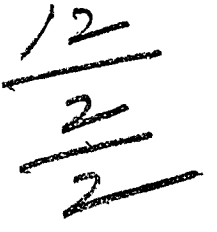

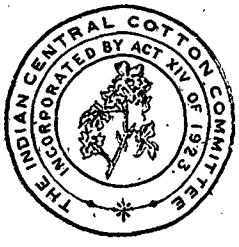

ANNUAL REPORT

OF THE

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Indian Central Cotton Committee,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST

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ANNUAL REPORT

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Indian Central Cotton Committee, Bombay,

FOR THE

Year ending August 31st, 1928.

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1928.

CHAPTER I.

THE Indian Central Cotton Committee is the result of the report of the Indian Cotton Committee published in 1919 and as first constituted, by resolution No. 404-22 of the Government of India in the Department of Revenue and Agriculture, dated the 31st March 1921, was purely advisory. In 1923, at the request of the trade, the Government of India passed the Indian Cotton Cess Act which incorporated the Committee and provided funds for the promotion of research in the growing and marketing of cotton by the levy of a cess of 2* annas a bale on all cotton exported and consumed in mills in British India. The provision of funds enabled the Committee to embark on a programme of research into the agricultural, marketing and technological problems connected with the industry.

2. The Committee is a body on which all cotton interests are represented and was organized for the purpose of improving and developing the growing and marketing of cotton in India. The success that has attended the work of the Committee led the Royal Commission on Agriculture to recommend for the Jute Crop a similar organization which will combine the growing, commercial and scientific interests. The Commission also saw no objection to the formation of Committees with similar constitution for other crops, provided the trade interested in the particular product taxes itself for the purpose. The importance of bringing together the different sections connected with a commercial crop like cotton and jute cannot be overestimated and there can be little doubt that the pieces of cotton legislation already carried through on the recommendation of this Committee would have been impossible had there been no common meeting ground for all sections of the trade. The organization is likely to be of even greater benefit to the grower when the improved cottons, produced as the result of the Committee's research schemes, come into the market in commercial quantities.

3. The work of the Committee falls under the following main heads :—

(1) *ADVISORY.*—The Committee advises both the Central and Provincial Governments in cotton growing and marketing by dealing with references made to it and also by taking the initiative in matters which the Committee considers require attention.

* 4 annas for the first three years.

(2) *IMPROVEMENT OF MARKETING.*—The Committee has been instrumental in getting two important legislative measures passed into law. These have been of great value in obtaining for the grower a better price for his produce. Investigations into the methods of marketing in each of the major cotton-growing provinces of British India have recently been completed by means of funds provided by the Committee. The attention of Local Governments will be drawn to any customs which act detrimentally to the interests of the grower.

(3) *STATISTICAL.*—The Committee has made itself responsible for the greater reliability of all statistics dealing with Indian raw cotton and has already achieved considerable success. The Committee also acts as an information bureau for all interested in cotton.

(4) *AGRICULTURAL RESEARCH.*—This is carried out at the Indore Institute of Plant Industry whose funds are derived mainly from the Committee and also by grants to Provincial Agricultural Departments for definite lines of work approved by the Committee.

(5) *TECHNOLOGICAL RESEARCH* is carried out in the Committee's own Technological Laboratory in Bombay. In addition to the Spinning Laboratory where tests on Standard Indian Cottons and on samples of new strains produced by the Agricultural Departments are made, the Research Laboratory deals with the determination of the properties of the cotton fibre.

(6) *TRAINING OF RESEARCH WORKERS.*—The Committee provides scholarships for the training of research workers in the different sciences connected with cotton. Apart from training its own staff for much of the research work being carried out in the provinces and in its own Institutes, many ex-holders of the Committee's scholarships have been absorbed for cotton work by various Agricultural Departments.

(7) *FUMIGATION OF AMERICAN COTTON* was undertaken from 1925 by the Committee, on its recommendation, to prevent the possibility of the Mexican boll-weevil entering India.

PERSONNEL.

4. Under Rule 3 of the Indian Cotton Cess Rules, members hold office for three years and one-third retire each year in rotation. The members for 1928 are :—

(1) PRESIDENT—Dr. D. Clouston, C.I.E., Agricultural Adviser to the Government of India, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. R. D. Anstead, C.I.E., Director of Agriculture.
Bombay	Mr. T. F. Main, O.B.E., Director of Agriculture.
United Provinces ..	Mr. G. Clarke, C.I.E., Director of Agriculture.
Punjab	Mr. D. Milne, C.I.E., Director of Agriculture.
Central Provinces ..	Mr. F. J. Plymen, Director of Agriculture.
Burma	Mr. T. D. Stock, Deputy Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.—Dr. D. B. Meek, O.B.E.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Mr. W. Ellis Jones, M.L.C. (*Vice-President*).
The Bombay Mill-owners' Association. .	Mr. S. D. Saklatvala.
The Bombay Chamber of Commerce ..	Mr. A. Fotiadi.
The Indian Merchants' Chamber, Bombay ...	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E., M.L.A.
The Karachi Chamber of Commerce ..	Mr. F. G. Travers.
The Ahmedabad Mill-owners' Association. .	Seth Kasturbhai Lalbhai.
The Tuticorin Chamber of Commerce ..	Mr. S. L. Symonds.
The Upper India Chamber of Commerce	Mr. S. H. Taylor.
The Empire Cotton Growing Corporation	Mr. W. Roberts.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Sir Sorabji B. Mehta, Kt., C.I.E. Rao Bahadur K. J. Deshmukh.
Madras	Mr. Robert Lee.
Punjab	Rai Bahadur Lala Sewak Ram, M.L.C.
Bengal	Mr. B. K. Lahiri.

(7) Co-operative Representative—Rao Saheb V. Krishna Menon.

(8) Representatives of Cotton Growers.

Madras	M.R.Ry. R. Appaswamy Naidu Garu. M.R.Ry. B. P. Sesha Reddi Garu.
Bombay	Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. (Surat). Mr. Bakshi Darshan Singh (Sind).
United Provinces ..	Rao Bikram Sinha, M.L.C. Rai Bahadur M. Amba Prasad, M.L.C.
Punjab	Sardar Ujjal Singh, M.A., M.L.C. Capt. L. H. G. Conville.
Central Provinces and Berar.	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe, M.L.C.

(9) and (10) Representatives of Indian States.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General of Commerce and Industry.
Baroda State	Mr. C. V. Sane, B. Ag., M.Sc., Director of Agriculture.
Gwalior State	Mr. Hiralal H. Pandya, Administrative Officer, Department of Agriculture.
Rajputana and Central India States	Mr. A. Howard, C.I.E., Director of the Institute of Plant Industry, Indore.

(11) Additional Members nominated by the Governor-General in Council.

1. Dr. L. C. Coleman, Representative of the Mysore State.
2. Mr. C. R. Palairet, Member for Industries, Holkar Durbar, Representative of the Holkar State.
3. Mr. G. R. Hilson, Cotton Specialist, Madras.
4. Dr. W. Youngman, Economic Botanist for Cotton, Central Provinces.
5. Rao Saheb Bhimbhai M. Desai, Deputy Director of Agriculture, Gujerat, Surat.
6. Lala Niranjan Prasad, Representative of the Karachi Indian Merchants' Association, Karachi.
7. Dr. W. Burns, Principal, Agricultural College and Economic Botanist to Government, Bombay.

Secretary (appointed by the Government of India): Mr. J. H. Ritchie, M.A., B.Sc., I.A.S.

Deputy Secretary: Mr. W. J. Jenkins, M.A., B.Sc., I.A.S.

Mr. W. Ellis Jones, who has represented the East India Cotton Association on the Committee since 1922, was re-elected *Vice-President* for the year 1928-29.

The Standing Finance Sub-Committee put on record its appreciation of the services of Messrs. Meli, Goodall and Coleridge during the time they served on the Committee.

SUB-COMMITTEES.

5. The following members were appointed to form the *Standing Finance Sub-Committee* required by the Indian Cotton Cess Rules :—

Mr. W. Ellis Jones (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. F. G. Travers, Mr. A. Fotiadi, Mr. T. F. Main, Mr. S. L. Symonds and Rao Bahadur Bhimbhai Ranchodji Naik.

Eleven meetings were held during the year.

6. *The Local Sub-Committee* is composed of the following members :—

Mr. W. Ellis Jones (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. F. G. Travers, Mr. A. Fotiadi, Mr. T. F. Main, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. C. V. Sane, Rao Bahadur K. J. Deshmukh, Mr. S. L. Symonds and Seth Kasturbhai Lalbhai.

This Sub-Committee consists of all members living in or near Bombay, and any up-country member who may be in Bombay at the time of a meeting. The Sub-Committee deals with all matters of general interest between meetings of the full Committee and thus relieves it of a considerable amount of work at the time of its half-yearly meetings. Seven meetings were held during the year under review.

7. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee was appointed for the purpose of Section 2 (*f*) of the Cotton Ginning and Pressing Factories Act of 1925 to deal with matters arising out of the Act. The membership for 1928 is as follows :—

Mr. W. Ellis Jones (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. A. Fotiadi, Mr. S. D. Saklatvala, Mr. F. G. Travers, Sir Sorabji B. Mehta, Sardar Ujjal Singh, Rao Saheb V. Krishna Menon, Mr. S. H. Taylor, Mr. S. L. Symonds and Mr. Robert Lee.

Eight meetings of the Sub-Committee were held during the year, including one special meeting with the Hon'ble Sir Geoffrey Corbett, Secretary to the Government of India, Commerce Department, to discuss the marking of bales.

8. *Special Sub-Committee on the Finance of the Cotton Crop Up-country.*—The following members were elected to this Sub-Committee at the sixteenth meeting of the Committee :—

Mr. W. Ellis Jones, Mr. T. F. Main, Rao Saheb V. Krishna Menon, Rao Bahadur Bhimbhai Ranchodji Naik, and Sir Joseph A. Kay and Mr. B. F. Madon (co-opted members).

This Sub-Committee held one meeting during the year and examined and reported on the Sind and second Khandesh inquiries. These will be commented on in a later part of the report.

9. *Agricultural Research Sub-Committee.*—This Sub-Committee meets during the meetings of the full Committee and reviews the progress reports of the workers on the schemes financed by the Committee, examines new research proposals and studies the reports of Research Students. It consisted of the following members appointed at the sixteenth meeting :—

Dr. D. Clouston, Mr. W. Ellis Jones, Mr. A. Howard, Rao Saheb V. Krishna Menon, Mr. S. D. Saklatvala, Mr. W. Roberts, Mr. T. F. Main, Mr. D. Milne, Mr. R. D. Anstead, Dr. W. Youngman, Mr. G. Clarke and Mr. G. R. Hilson, Mr. Trevor Trought and Dr. W. Burns (co-opted members) and the Secretary.

In addition Messrs. Plymen and Collins and Dr. H. H. Mann were co-opted for the seventeenth meeting.

10. *Technological Research Sub-Committee.*—This Sub-Committee met as usual during the meetings of the full Committee and dealt with all matters pertaining to the Technological Laboratory and Technological Research. The Sub-Committee appointed in December 1927 consisted of :—

The President, the Vice-President (*ex-officio*), Sir Purshotamdas Thakurdas, Sir Sorabji B. Mehta, Mr. S. D. Saklatvala, Seth Kasturbhai Lalbhai, Mr. D. Milne, Mr. A. Howard, Mr. T. F. Main, Mr. G. R. Hilson and the Secretary.

11. *The Research Students' Selection Sub-Committee.*—This Sub-Committee met during the cold weather meeting in December to select suitable students for scholarships. Only three studentships were awarded at this time owing to lack of applications and a special Selection Sub-Committee was held in February 1928 and filled three more vacancies.

12. Most of the detailed work is carried out by means of these Sub-Committees and the full Committee is thereby saved considerable time at its half-yearly meetings. The local members in particular have, as usual, spared no time in the Committee's work and to them much of the success which has attended the Committee's labours is due.

MEETINGS.

13. The Committee met twice during the year, viz., on the 12th, 13th and 14th December 1927 and on the 30th and 31st July 1928. At the December meeting, the Hon'ble Mr. G. B. Pradhan, Minister for Agriculture, Bombay Presidency, Sir Joseph A. Kay, Kt., Sir N. N. Wadia, Kt., K.B.E., C.I.E., Messrs. G. Boyagis, T. Sasakura and G. C. Tambe and Dr. W. Burns were present as visitors.

Dr. W. Burns was appointed an additional member of the Committee from the 15th March 1928 thus bringing the total membership to 44.

STAFF.

14. Mr. Burt held charge of the office of Secretary up to March 29th, 1928 when he left to take up the appointment of Director of Agriculture, Bihar and Orissa. He handed over charge to Mr. J. H. Ritchie, appointed by the Government of India in his stead.

At its seventeenth meeting, the Committee recorded its appreciation of Mr. Burt's services during his seven years' Secretaryship by passing the following resolution :—

" The Central Cotton Committee desire to place on record their high appreciation of the services of Mr. B. C. Burt during the seven years he worked as their Secretary. They feel that much of the success of the work they have been able to carry through has been due to Mr. Burt's ability, energy, resourcefulness, tact and co-operation with the local members, and they desire that a copy of this resolution should be forwarded to the Government of India and to Mr. Burt."

Mr. Jenkins, on the return of Mr. Howard from leave, reverted from his officiating appointment of Director, Institute of Plant Industry, Indore, and assumed charge of his substantive post of Deputy Secretary on the 25th November 1927. Mr. Jenkins proceeded on 8½ months' leave from February 15th, 1928.

Mr. J. H. Ritchie officiated as Deputy Secretary from 15th February until he was appointed Secretary.

A new agreement was entered into between the Committee and Mr. Richardson, Spinning Master, Technological Laboratory, for a further period of three years from April 8th, 1928.

The Standing Finance Sub-Committee sanctioned a post of temporary Economist for a period of six months to work up the results of the inquiries into the finance and marketing of cultivators' cotton. The post was filled by Mr. K. J. Khambata, M.A., LL.B., F.S.S., from 21st May 1928.

There were no other changes in the Committee's staff during the year.

15. *Provincial and Local Cotton Committees.*—Provincial and Divisional Cotton Committees met as follows during the year ending August 31st, 1928 :—

Punjab Provincial Cotton Committee	..	Once.
Bengal Provincial Cotton Committee	..	Once.
Sind Divisional Cotton Committee	..	Twice.
Gujerat Divisional Cotton Committee	..	Twice.

In Bombay no Provincial Cotton Committee has yet been formed and the Bombay Government continued to refer matters of provincial interest to the Local Sub-Committee while other matters of local interest were dealt with by the Divisional Cotton Committees.

The Indian Cotton Committee (McKenna Committee) of 1917-18 envisaged Provincial Committees which would act as advisory bodies to their Local Governments and would work in close co-operation with the Indian Central Cotton Committee, the apex of the organization. Unfortunately, many of them are in a moribund condition, and exercise no influence on the cotton policy of their provinces. Some require to be re-constituted so as to

include representatives of all branches of the trade as well as of the Agricultural Department and also the Provincial representatives on the Indian Central Cotton Committee. The recommendations of the Indian Central Cotton Committee to Provincial Governments would have more weight if they had the backing of an influential Provincial Committee.

16. *Report of the Royal Commission on Agriculture.*—The Report of the Royal Commission on Agriculture, published in June, contains many references to the Committee's work. One of the main recommendations is the constitution of a Council of Agricultural Research which will derive its funds from a non-lapsing grant from central revenues. The administration of this grant will be analogous to that of the Central Cotton Committee with respect to the funds raised under the Indian Cotton Cess Act of 1923. The powers of the Council will be regulated by rules similar to those issued under Section 15 of the Cotton Cess Act. One of the members of the Council will be nominated by the Indian Central Cotton Committee and although research on cotton will be excluded from the work of the Council, the necessary link will be formed by the Chairman of the Council becoming President of the Committee in place of the Agricultural Adviser to the Government of India whose post will be abolished.

The Report approves the action of the Committee for bettering the marketing of cotton by pressing for the necessary legislation ; for its endeavours to check abuses and malpractices and for carrying out economic inquiries into the financing and marketing of the growers' cotton. The Report comments on the mixing of cotton, particularly in the Punjab, and states that the evidence received completely supports the view taken by the Indian Central Cotton Committee of the seriousness of the deterioration which has resulted. In this connection it is stated "We do not consider it necessary to discuss the form these (the means of dealing with mixing) should take as we have every confidence in the ability of the Indian Central Cotton Committee to deal adequately with this and all other questions affecting Indian cotton."

The Commission strongly supports the views of the Committee with regard to the importance of securing the co-operation of the maritime Indian States in guarding against the danger of foreign pests entering India. They recommend the establishment of regulated markets for all crops on the lines of those for cotton in Berar, as modified by the Committee and recently adopted in Bombay under the Cotton Markets Act. The report also remarks on the importance of the work accomplished by the Committee in securing reliable statistics of the consumption and production of cotton in India. The desirability of co-operation with Indian States in all matters relating to the prosperity of India as a whole is emphasized and the constitution of the Committee is quoted as showing the value of such co-operation.

In Appendix II will be found excerpts from the Report which deal with the Committee's work.

CHAPTER II.

THE WORK OF THE YEAR.

17. It is seven years since the Committee was first constituted and five years since it was provided with funds of its own which enabled research in agriculture and technology to be financed and carried out. The first few years of the Committee's existence were spent in devising legislative measures to deal with the better marketing of cotton and later years have been devoted to the consolidation of the positions gained and to the initiation of schemes of research. The next quinquennium will see several research schemes reaching fruition. Those originally sanctioned have now completed five years but it is yet too early to expect results from them. There are indications, however, that the Committee, at the end of its first decade, will be able to show the means of adding materially to the quality and quantity of Indian cottons. At the seventeenth meeting the Agricultural Research Sub-Committee made a very careful investigation into those schemes which had completed five years' work and was able to report that they had been drawn up on the right lines and were likely to produce results of very great value. Full details of all the research schemes being financed by the Committee are given in a subsequent chapter. In the improvement of marketing, the Committee financed five inquiries into the finance and marketing of cultivators' cotton in four provinces, including Sind. These were completed towards the end of the year. The working of the Cotton Transport Act and the Cotton Ginning and Pressing Factories Act is reviewed below.

18. The short American cotton crop in 1927 of only 12,955,000 bales of 500 lbs. each, excluding linters, compared to the record crop of nearly 18 million bales of the previous year, caused prices to soar in August and September when the Bureau Report of 12,692,000 bales was announced. Prices reached 25 cents in New York in September but they fell steadily till the beginning of February when they again began to rise owing to an anticipated reduction in consumption not being realized. The area under cotton in India in 1927-28 was 24,722,000 acres, a decrease of 100,000 acres from the previous year. The yield was estimated at 5,871,000 bales of 400 lbs. each or an increase of 846,000 bales over the previous year. The press returns, however, show that the crops were underestimated to the extent of about 400,000 bales in both years. The issue of a fifth forecast in April for the Bombay Presidency supplied more complete information for the all-India Supplementary (April) Memorandum and was responsible for increasing the estimate by 360,000 bales. The arrival of the new crop coincided with a decline in export and 313,000 fewer bales were shipped in January, February and March than in the corresponding months in 1927. There was a revival in the three following months, however, and the total

exports of Indian cotton during the season amounted to 3,140,000 bales compared with 2,830,000 bales in 1926-27. The import of American cotton was again above normal being 67,231 bales instead of the 25,000 bales taken as the average. Owing to the prolonged strike in Bombay mills which has lasted for 4½ months in the year under report and to a decline in exports, the accumulation of stocks in Bombay is much heavier than has been the case for many years. At least 3 lakhs of the total bales in stock have accumulated owing to the mill strike. The following table gives the ascertained stocks of unsold cotton on the 31st August compiled from the East India Cotton Association's returns :—

Descriptions.	31st August 1928.	31st August 1927.	31st August 1926.	31st August 1925.	31st August 1924.
Broach	17,242	15,463	11,493	16,852	17,463
Dholleras	60,336	33,698	30,704	20,097	22,298
Oomra	263,443	41,905	62,378	54,055	73,049
Khandesh	70,238	4,795	15,292	12,464	16,846
Bengals	50,988	12,720	24,193	14,397	19,069
Punjab-American	13,085	3,762	11,188	4,542	17,311
Dharwar	4,870	4,085	4,883	6,850	2,795
Comptas, Tinnevellys and Cambodia	44,346	27,218	20,486	29,176	19,405
Westerns and Northerns ..	27,404	22,628	18,158	26,007	12,319
Persian	190	200	563	1,476	49
Americans	2,034	1,920	460	..	575
Egyptians	..	5	7	..	..
East Africans	9,150	6,659	10,549	4,787	7,434
Other sorts	37,635	6,520	13,326	11,134	24,954
Total ..	600,961	181,578	223,680	201,837	233,567

It will be seen that the biggest accumulation has been in the Bengals and Oomras cottons, the chief buyer of which is Japan. With such large stocks in Bombay and the prospects of a heavy crop, parity with America and Liverpool is likely to be unfavourable and imports of American cotton in 1928-29 will probably be reduced to normal or below normal. India now produces over 2 million bales of stapled cotton and this quantity is increasing yearly. India is now more than self-supporting in the matter of better quality cotton for her mills and there is no need for the import of American or African cottons except for those mills which specialise in very high counts. Prof. J. A. Todd in a recent review of the world's cotton remarks, " Except for India the progress made by ' outside growths,' taking that in the widest sense as meaning all cottons other than American, has been very slow, as measured by the number of bales produced. But India is a very important exception. It is not merely that the crop as a whole has increased from a pre-war average of four or five million bales to something like six million bales now, but the proportion of the total which is of something like American staple has increased substantially."

THE COTTON TRANSPORT ACT.

19. At the request of the Indian Central Cotton Committee, the Cotton Transport Act was passed in 1923 to give powers to Local Governments to protect any area of cotton by restricting and controlling the transport by rail and the import of cotton into the notified zone. The Act has been of great service in rehabilitating the cottons of the areas where it has been applied and the growers have reaped the benefit of enhanced prices.

20. *BOMBAY.*—There was no change in the areas protected under the Cotton Transport Act in the Bombay Presidency during the year. They were as follows :—

(1) *In Gujerat*: There were three protected areas, viz., the South Surat, the Surat and the Olpad-Ankleshwar zones.

(2) In the Southern Division there were also three protected areas, viz., the Kumpta-Dharwar, the Bijapur and the Bagalkot zones.

The agricultural policy in the Gujerat area is to have one improved variety, viz., 1027, grown south of the Narbada River, but in order to exclude certain areas of inferior cotton still being grown in the Olpad Taluka, three zones were constituted. In 1926, however, on the assurance that the growers in the group of Co-operative Societies centring round Sonsek in the Olpad Taluka would sow the improved seed, the road restrictions were withdrawn (although the rail restrictions still apply) subject to cancellation of the concession if inferior cotton were found to be grown there. Unmistakable evidence was received at the end of a year's working that impure seed of the inferior variety was still being grown in the Sonsek area and the Committee at its sixteenth meeting thereupon asked for the re-imposition of the restrictions on road transport. A conference was held between the members of the Local Sub-Committee and the Hon'ble the Minister for Agriculture to discuss the question. It was decided that the matter would be taken up at the September session of the Bombay Legislative Council but owing to the changes of Ministers holding the agricultural portfolio it is regretted that nothing will be done before the new season commences.

No further action has been taken by the Bombay Government to protect the Broach area under the Cotton Transport Act though the matter is still being considered. The Committee recommended that the area should comprise the following :—

(1) The whole of the Broach District between the Narbada and the Mahi Rivers, (2) that portion of the Baroda State which lies between the Narbada and the Mahi Rivers, and (3) the whole of the Panch Mahals District and the States in the Rewa Kantha Agency.

21. On the recommendation of the Committee, the administration of the Act in the three protected zones in the Southern Division has been tightened up by the establishment of sixteen road check stations (eight in the Kumpta-Dharwar area, five in the Bagalkot area and three in the Bijapur area) to prevent inferior cotton entering these areas by road from outside. The Committee has also recommended to the Bombay Government that a sufficient number of road check stations should be opened so as to prevent Barsi and Sholapur cotton entering the Kumpta-Dharwar protected areas through the Indian States of the Southern Mahratta Confederacy which act as the Eastern boundary. The Committee received ample proof that inferior cotton was entering the Indian States which are part of the protected area. The Bombay Government, again on the advice of the Committee, rejected an application from the cotton *dalals* and merchants of Hubli asking that Bagalkot cotton should be allowed into the Hubli market without restriction. The growers of this area have benefited greatly by the application of the Cotton Transport Act, as the price and reputation of both the Kumpta and Dharwar-American cottons have increased by the checking of the wide-scale adulteration with short-stapled cotton from Khandesh and with mill fly from Bombay. The mixing of the two varieties grown inside the area still continues, however. One consignment was rejected in arbitration in the East India Cotton Association for being mixed and it is possible that herein lies the remedy. Licences were again issued for Dharwar-American *kapas* from the Nizam's Dominions into the Gadag market.

The new strains evolved by the Agricultural Department, Gadag No. 1 (American) and Dharwar No. 1 (Kumpta), were grown on 102,000 acres and 177,800 acres, respectively, in the protected area, so that better types both as regards yield and quality of lint are now available in the market in commercial quantities.

22. *BARODA.*—There was no change in the Cotton Transport Act as applied to Baroda State.

23. *RAJPIPLA.*—The whole of the State now grows the improved 1027 variety. In order to discourage the growth of Goghari and to ensure that nothing but pure cotton should leave the State, the Durbar prohibited the export of anything but the improved variety. This well-intentioned action was misinterpreted by certain sections of the trade which jumped to the conclusion that if Goghari cotton were not allowed to leave the State as such, it would be mixed with the improved variety, and the premium for the cotton fell considerably. Tests made at the Technological Laboratory showed there was no reason for the fall in premium as no trace of Goghari cotton was found in the bales tested. So that the growers should not again suffer, the Committee circulated the results of the tests to reassure the trade that the cotton had not deteriorated. The Dewan also attended a meeting of the Local Sub-Committee and described the steps being taken to ensure that nothing but pure 1027 cotton was sown.

These steps leave no doubt that the Durbar is doing everything in its power to maintain the purity and reputation of the State cotton. Ten years ago Rajpipla cotton was a drug on the market. Now it has special standards of its own, almost equal to those of the best Surat. This has been achieved by the exclusion of inferior cotton from outside by means of the Cotton Transport Act, by the introduction of a superior variety and by the State control of the ginning factories.

24. *CHHOTA UDEPUR.*—This State introduced a Cotton Improvement Act in August 1927, the main provisions of which are the prohibition of imports of cotton grown outside the State (except under license), the adoption throughout the State of the 1027 Surat variety of cotton and the control by the State of gins and presses. It is hoped that the cotton of this State will gain a reputation like that of Rajpipla at no distant date. The area under cotton during the year was 51,930 acres with an estimated yield of 8,655 bales.

25. *MADRAS.*—The Cotton Transport Act was put into force in the Madras Presidency by Notification No. 344 of the 18th November 1925 in three areas : (1) Northerns and Westerns, (2) Tinnevelly, and (3) Tiruppur-Cambodia. In order to simplify their work of introducing improved varieties, the Agricultural Department put forward a proposal to protect the Salems tract and to create a new protected area between the Cambodia and Tinnevelly zones, thus making four protected areas in the south of the Presidency. This proposal did not meet the wishes of certain branches of the trade which desired to reduce the number of zones by amalgamating the Tinnevelly and Cambodia areas. The Provincial Board of Agriculture endorsed the views of the trade and passed a resolution in February 1927 that there should be only two protected areas, viz., (1) Northerns and Westerns and (2) the Southern Tract comprising all the districts in the present two protected zones of Tinnevelly and Tiruppur-Cambodia. The Madras Government accepted the views of the trade and of the Board of Agriculture and intends to move at the next meeting of the Legislative Council a revised notification* and rules under the Cotton Transport Act constituting only two protected areas in the Presidency. The Central Cotton Committee has requested the Madras Government to reconsider their decision if it is found at a later date that the enlarged zone proves detrimental to the successful introduction of the improved varieties of the Agricultural Department.

26. *CENTRAL PROVINCES.*—The Indian Central Cotton Committee in July 1927 recommended the formation of a single protected area so as to exclude inferior Khandesh and Central India cottons from the following cotton-growing districts of the Central Provinces and Berar.—Buldana, Akola, Amraoti, Yeotmal, Wardha, Chanda, Nagpur, Chhindwara, Seoni and Bhandara. In anticipation of the action of the Local

* Appendix III.

Government, the East India Cotton Association made Malkapur a tenderable station for Oomras cotton. It was hoped that this action on the part of the East India Cotton Association would allay any opposition there might be to the application of the Act. No action has yet been taken by the Central Provinces' Government. The delay appears to be due to the cost of applying the Act to road transport on the long land boundary between Khandesh and Buldana Districts. The view is held by the trade in Bombay that it is the rail transport which is important and which should be prevented and the Central Provinces' Government has been asked to apply the Act so as to prohibit the import of cotton by rail in the first instance. The inclusion of Malkapur in the Oomras Schedule has benefited the merchants of that Taluk but the growers in the Central Provinces and Berar have lost considerably by the lowering of the standard.

27. *INDORE.*—At the instance of the Indian Central Cotton Committee the Holkar and Gwalior Durbars were asked to protect their valuable Malwa cottons by the application of a Cotton Transport Act to keep out the inferior Rajputana-Bengals cottons which are being imported into Central India stations in considerable quantities. The Holkar State has drawn up a Bill* on the lines of the British India Act to protect the State cotton against import by rail only. This step should help to stay the loss of reputation of Malwa cottons caused by admixture with and substitution by inferior Bengals cotton, and should be of great assistance when an improved type of cotton is ready for distribution from the Indore Institute of Plant Industry.

The Gwalior Durbar has the subject still under consideration.

28. *HYDERABAD.*—A Cotton Transport Act on the lines of the one in British India has recently been passed by the Legislative Council but as it is unlikely to be brought into operation before the cotton season commences, the Hyderabad State Cotton Transport Ordinance, promulgated last year, has been extended so as to ensure that there will be no danger of inferior cotton entering the protected area. The intention is to protect the long-stapled *Bani* or *Gaorani* cotton which is still grown in large areas in the State. The short '*neglectum*' cottons have been making much headway in the State owing to their high ginning percentage. Systematic distribution of pure *Gaorani* seed from the Umri tract has resulted in a much larger area being sown this year. The Ordinance protects the cotton-growing areas of the Nander Civil District and portions of the Bidar and Adilabad Districts. Although there are large areas of *Bani* in the adjoining district of Parbhani, much of the cotton coming to the market is short staple and the district was excluded. In order to encourage the growth of the long-stapled cotton, auction sales of *Bani* cotton were organised in the Parbhani market and premia up to Rs. 3 per candy of 480 lbs. of *kapas* were obtained. Special arrangements for

* Appendix IV.

storing *kapas* until a sufficient quantity is available have been made for the coming crop. This, it is hoped, will induce Bombay buyers and representatives of mills to attend.

THE COTTON GINNING AND PRESSING FACTORIES ACT, XII OF 1925.

29. This Act came into force in August 1925 and has thus been in operation for three years. Section 14 of the Act became effective from the commencement of the 1926 season. This section ordains that "any person who has made a contract for the purchase of baled cotton may require that no bales other than bales marked in accordance with Section 4 shall be supplied in fulfilment of such contract, and, if he does so require, no bale not so marked shall be tenderable in fulfilment of the contract." The East India Cotton Association amended two of their By-laws to give effect to the above section and cotton not marked in accordance with the Act (or with the law in force for the marking of bales in any Indian State) is liable to rejection and penalty. Rule 7 of the Rules under the Act lays down the manner in which the marking should be carried out. It was found that bales being tendered very often had minor faults in marking, e.g., the stars before and after the running numbers were missing and running numbers were being stencilled on the round instead of the flat side. Because of the strictness of Rule 7, the arbitrators had no option but to reject the consignments containing such bales, even though the bales were identifiable and the cotton passed with an 'on' allowance. It was therefore considered that the rule should be made less strict so as to give discretionary powers to the arbitrators of an organized cotton association to pass bales not marked absolutely in conformity with the rule so long as they could be traced back to the original owner. At a special meeting held with the Hon'ble Sir Geoffrey Corbett it was decided to add a proviso to the rule and one was gazetted a week later. The Government of India, however, put a time limit on the operation of the proviso and asked the Committee to recast the rule so as to eliminate those portions of it which experience had shown not to be absolutely essential to the carrying out of the purposes of the Act.

At the request of the Committee, the Government of India drew the attention of Local Governments and Indian States to the haphazard way in which marking was being carried out in certain presses and asked for the inspection of presses at the commencement of each season in order to see that they were provided with the necessary appliances for the marking of bales.

All cases of faulty marking brought to the notice of the Committee were reported to the authorities concerned and prosecutions were launched against the owners of three presses, two of which resulted in conviction and fine. In all other cases the owners were warned. One press manager

in the Central Provinces was fined Rs. 40 for failing to furnish a requisition for a certified copy of the press register in connection with bales which had been penalized for dampness.

A few cases of cotton which had been rejected for dampness and false packing were reported. Certified copies of the press registers pertaining to the bales were obtained and sent to the East India Cotton Association which posted them on their notice-boards. Although nothing further can be done as the Act stands at present, the fear of publicity for such malpractices has a marked deterrent effect.

The Nizam's Government circularised all owners of cotton gins and presses in the State drawing their attention to Rule 9B of the Rules and Regulations relating to the establishment of factories in the State which prohibits the adulteration of cotton by mixing short and long-stapled varieties.

The Holkar Government also passed the following rule under the Holkar State Cotton Ginning and Pressing Factories Act :—

" Any owner, occupier, lessee, engineer, fitter or other person owning, occupying, working or being in charge of a Cotton Ginning or Pressing Factory or any trader or an Agent who brings his cotton for the purpose of being ginned or pressed who allows the admixture of *kapas*, cotton seed—either whole or cut, cotton waste, oily or dirty cotton or sweepings, or any other foreign material, with ginned cotton ; or who through careless or deliberate adjustment of the machinery or through any other cause whatsoever allows the mixture of *kapas*, cotton seed, cotton waste, oily or dirty cotton, sweepings or other foreign material with ginned cotton, shall be fined to the extent of Rs. 1,000 for the first offence and for any subsequent offence the Government may, in addition to the prescribed penalty, cancel his license, for owning, occupying or working the factory. If the offence is committed by a trader or other person, who is not the owner or licensee of the factory, he may be fined to the extent of Rs. 2,000 for each such offence."

30. The marking of bales is now compulsory in the following Indian States :—

Hyderabad (the Nizam's Dominions), Baroda, Indore, Alwar, Nabha, Jodhpur, Jaipur, Rajpipla, Navanagar, Cambay, Katosan, Jhalawar, Limbdi, Wankaner, Chhota Udepur, Barwani, Alipura, Savanur, Idar, Jhabua, Rutlam, Datia, Porebandar, Morvi, Gondal, Wadhwan, Manavadar, Bhavnagar, Mudhol, Sachin, Junagadh, Bhopal, Dhrangadhra, Radhanpur, Rajkot, Kapurthala, Faridkot, Jind, Tonk and Lakhtar.

2. Weekly cotton press returns are received from all the above States except the following :—

Jhalawar, Limbdi, Wankaner, Savanur, Jhabua, Datia, Morvi, Gondal, Wadhwan, Manavadar, Bhavnagar, Sachin, Junagadh, Radhanpur, Rajkot, Kapurthala, Faridkot, Jind, Tonk and Lakhtar.

Except for Mysore, which is the only important State which has not yet introduced an Act, the marking of bales is now carried out in practically the whole of India. Complete returns of cotton pressed will be of inestimable value in preparing and checking forecasts. They will provide forecasting officers with the means of showing where past inaccuracies and discrepancies lay.

31. Several instances of the use of old hoops bearing the marks of two presses were brought to light. The Committee proposed an amendment to Rule 7 under the Act to deal with this. It was found, however, that the Act itself would have to be amended and the Committee finally decided that cases should be dealt with on their merits by the arbitrators under the new proviso to Rule 7.

WEIGHTS AND SCALES IN COTTON GINNING AND PRESSING FACTORIES.

32. The draft rules for Bombay, which were approved by the Cotton Ginning and Pressing Factories Sub-Committee last year, were completely accepted by the Bombay Government and have been brought into operation from the 1st September 1928. Collectors of Districts received instructions to bring the rules to the notice of the owners of ginning factories and presses and they will be explained in the villages by Circle Inspectors, Mamlatdars and Prant Officers. The rules will be found in Appendix V.

The Madras Government has also prescribed standards for the accuracy of weights and scales by amending the Standing Orders of the Board of Revenue (and not under the Cotton Ginning and Pressing Factories Act) so that they apply to all weights and scales and not only to those used in cotton ginning and pressing factories. The English Board of Trade standards of tolerance and sensibility have been adopted instead of the more lenient scale in Bombay. A comparative statement will be found in Appendix VI.

MALPRACTICES.

33. Watering was not so prevalent as last season, only a few cases being reported to the Committee. As already mentioned the posting of the names of offending presses by the East India Cotton Association has a deterrent effect and it is hoped that the rejection of the cotton will prove a corrective. The evil seems to have spread from the Central Provinces and Berar to other growths and some cases of watered Broach cotton, which up to date has been free from the practice, were reported. The Joint Cotton Committee, Karachi, has decided to penalize heavily all cases of watering and excessive seed found in bales.

The Committee devoted considerable time to the question of the mixing of *desi* with Punjab-American cotton and it was decided that the Punjab Government should be asked to examine the question with a view to the prevention of the abuse. The matter was purely a provincial one and the Committee was not prepared to recommend legislation of an all-India character. The attention of Millowners' Associations in India, Europe and Japan was drawn to the support given to mixing by their members buying mixed cotton, and they were requested to give encouragement to the sale of pure cotton by paying a full price for it when available. The Director of Agriculture, Punjab, has agreed to issue from time to time for the benefit of the trade, reports indicating the purity and area of the American crop in the various districts of the Punjab to inform buyers interested in pure cotton where it can be found.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

34. During the year under review, five investigations were made into the finance and marketing of cultivators' cotton in four Provinces, including Sind. The enquiries were carried out by the Agricultural Departments and were financed by the Committee. The places selected were (1) Sind, (2) Middle Gujerat, (3) the Northerns and Westerns Tract in Madras, (4) the Punjab, and (5) Khandesh. In 1926 enquiries were made in the same tracts in Madras and Khandesh. The previous investigations in Madras were carried out by the staff of the Agricultural Department in addition to their legitimate duties and was in consequence not as complete as it was intended. The present investigation has been carried out by a staff deputed specially for the work. A repetition of the Khandesh enquiry was undertaken so that it might act as a basis of comparison for those carried out this year, as well as to ascertain any changes that might have taken place due to a fall in prices after the previous enquiry was completed. The Punjab enquiry was conducted in co-operation with the Punjab Board of Economic Enquiry which financed a similar enquiry in the South East Punjab while the Committee's grant provided for the investigation in the Canal Colonies.

All the investigations have been completed. Four have been written up and summarized, and will be put before the Special Sub-Committee appointed to deal with this subject. The Committee will then make recommendations, where necessary, to the local Governments with regard to improving the conditions under which the cultivator grows and markets his cotton crop.

OPEN COTTON MARKETS.

35. The inquiries enumerated above and those previously carried out have provided valuable information on the methods of marketing in the various cotton tracts, and have more than justified the recommendation of the Indian Cotton Committee (McKenna Committee) of 1917-18 that the Berar type of open cotton market was one to be followed in other

parts of India. In 1923 the Central Cotton Committee drafted a Bill on the Berar model with modifications which did away with the undesirable features of Berar markets. The chief modification provided for the representation of growers on Market Committees. This draft Bill was circulated to all Local Governments and Indian States, and has been utilised as a model in several instances.

INDORE.

36. As reported last year, the Holkar Durbar established an open cotton market at Sanawad in 1925, which was controlled by a Market Committee on which growers were represented. During the year one more was opened at Barwaha and two more will be opened in time for the coming season. That they were successful is proved by the fact that 77 per cent. of the *kapas* was brought by growers in the Sanawad market and 68 per cent. in the Barwaha market.

HYDERABAD.

37. H. E. H. the Nizam's Government drew up draft rules for the establishment of an experimental cotton market at Parbhani which it is hoped to open in the coming season. A copy of the Rules will be found in Appendix VII.

THE BOMBAY COTTON MARKETS ACT.

38. The Bill as published in the last report has become law without any material change. The framing of the rules under the Act is at present under the consideration of the Bombay Government and the Committee will be consulted regarding them before they are put before the Legislative Council. The draft rules drawn up by the Committee and circulated to Local Governments in 1923 have been taken as the model on which the rules are being based.

39. The Central Provinces Government has under consideration the modification of the Central Provinces and Berar Market Rules so as to permit representation of growers on Market Committees and to do away with certain abuses. Market Committees have been consulted and it is likely that the amendments will be carried through at an early date.

MARKETING OF IMPROVED VARIETIES OF COTTON.

40. The Technological reports on standard Indian cottons continue to give details to the trade of the areas and estimated outturn of improved cottons introduced by the Department of Agriculture. The increasing competition for these superior strains ensures that considerable quantities reach the mills in a state of purity, although certain varieties can seldom be obtained pure as they are mixed with inferior varieties and sold on type.

41. The three Cotton Exchanges, viz., the East India Cotton Association, Liverpool Cotton Association and the Manchester Cotton Association, were again supplied with type bales of the best of the improved Indian cottons. The inquiries received show that they have been of great value in bringing to the notice of spinners in India and in Europe the improved cottons now being grown in India. The best of these cottons are however in regular demand by Indian mills and until the quantity exceeds the Indian demand, it is unlikely that they will be exported except against definite orders.

42. The Indian Central Cotton Committee has been pressing for some years for the lowering of the basis of the Empire Futures Contract in the Liverpool Cotton Exchange and our request has at last been granted. From the 1st July 1929, the basis will be 'Low Middling' instead of 'Strict Low Middling' and many Indian cottons will now be tenderable which were not so formerly. It is unfortunate that this amendment to the Contract coincides with the very marked increase in the mixing of Punjab-American cotton with *desi*, as very little of this cotton will pass. If the standard had been lowered when the Committee first asked for it, there is every chance that the malpractice would not have become so prevalent.

COTTON MARKETING IN KARACHI.

43. The rapid growth of Karachi as a cotton port and market will be apparent from the figures of shipments of recent years. In 1921-22 these amounted to 3.39 lakhs of bales, in 1924-25 to 9.96 lakhs, in 1925-26 to 11.78 lakhs and in 1927-28 to 8.72 lakhs. Karachi is the natural outlet for the Sind and Punjab cotton crops which will increase greatly with the opening of the Sukkur Barrage and with further development in the Punjab. It also handles increasing quantities of Rajputana and U.P. Bengals cottons, so that the marketing of the crop there has an important bearing on the progress of cotton growing over a wide area. The Central Cotton Committee is charged with the improvement of cotton growing and marketing in India and has therefore a definite interest in the healthy development of the conditions of marketing affecting the growers of a large proportion of the Indian crop. The numerous complaints received from Europe of the faulty ginning of Sind and Bengals cottons led the Committee to enquire into the methods of marketing in Karachi, in the hope that some changes in market organization might help to discourage these malpractices. Meetings were held with the Karachi Chamber of Commerce and the Karachi Indian Merchants' Association, the two bodies interested in cotton export and marketing. The outcome of these discussions was that a Joint Cotton Committee of the Karachi Chamber of Commerce and the Karachi Indian Merchants' Association was formed which set on foot several important reforms in the Karachi market, chief being the setting up of standards for Sind and Punjab cottons, arrangement for surveys and the unification of the form of contract. The standards and the new contracts were brought into use in the 1927-28 cotton season. Surveys

were started in November-December by European surveyors of the Karachi Chamber of Commerce and the awards were made subject to the right of appeal to a board consisting of 24 members, 16 of whom were members of the Joint Cotton Committee. From March 1928 the right of survey was extended to a panel of 46 gentlemen elected by the Karachi Joint Cotton Committee. Previously, the right of survey was confined to European members of the Karachi Chamber of Commerce and this development has removed the chief grievance of the Indian Merchants' Association. Dealings in forward contracts in Karachi have expanded considerably and all forward contracts, unless specifically excluded, are now subject to monthly settlements. Negotiations are in progress between the Karachi Joint Cotton Committee and the East India Cotton Association, Bombay, regarding common standards in Bengal-Sind and Punjab-American cottons and an agreement is likely to be reached at an early date. The Joint Cotton Committee which is a permanent body is now well on the way to become an Association similar to the East India Cotton Association, Bombay. The Joint Cotton Committee has hopes that this will be achieved in about two years.

MEANS TO PREVENT THE INTRODUCTION OF THE MEXICAN BOLL-WEEVIL.

44. The fumigation in Bombay of all American cotton arriving in India was continued. Arrivals during the year amounted to 67,123 bales compared with 324,585 bales the previous year. The figures for the year under report are also higher than normal and in consequence the Committee was able to carry out the work at a cheaper rate than Rs. 3-1 a bale, the figure calculated for a normal import of 25,000 bales. This economy was made possible by a reduction in the cost of labour, staff and chemicals in dealing with a large quantity and also because all capital expenditure on barges, fumigating machines, etc., was written off last year. The Government of India has been asked to grant a rebate of 8 annas a bale on all cotton fumigated between the 12th July 1927 and the 31st July 1928. Most of the consignments were small and the two Government barges were able to accommodate them. Only one steamer with over 20,000 bales arrived during the period and, because of the large number of barges now available and adapted for the work, the staff was able to deal with this large consignment with the utmost dispatch. Fumigation was carried out entirely at Prince's Dock where the work can be done more expeditiously and conveniently. The extra monsoon fee was not levied either by the Bombay Port Trust or by Government so that importers paid the reduced fee of Rs. 3-1 throughout the year. The Government of India, on the recommendation of the Committee, sanctioned a rebate of 7 annas a bale on all cotton fumigated in the 1927 season and a sum of Rs. 1,19,686 was refunded to importers. A simplified system of accounts has been introduced whereby the expenses incurred by the Bombay Port Trust are deducted from the receipts before credit to Government.

COTTON STATISTICS.

45. *Rail-borne Trade Returns for Cotton.*—The Government of India accepted the Committee's recommendation and have decided to compile and publish statistics of rail and river-borne raw cotton, showing both exports from and imports into each trade block and also the origin and destination of the exports and the imports of cotton by trade blocks. These statistics will be introduced from 1st October 1928. The Royal Commission on Agriculture has strongly recommended the re-establishment of these statistics for all crops, including cotton, and has made several suggestions which, if accepted, will make them more valuable.

46. *Cotton Forecasts.*—The Government of India was asked by the Committee to examine the question of improving the accuracy of the fifth Supplementary Cotton Memorandum issued in April so that it might include revised estimates of cotton production from all the principal cotton-growing provinces. Several provinces were addressed by the Government of India and the Bombay Government issued a fifth forecast in April which included the prospects of the Kumpta-Dharwar and the Surat and Broach crops. The Baroda Durbar did likewise. The Hyderabad and Mysore Durbars have also sanctioned the issue of a fifth forecast from next year. The Governments of the remaining cotton-growing provinces have also agreed to report to the Director-General of Commercial Intelligence and Statistics any changes that may take place in the crop after the issue of the fourth forecast in February. The final figures will thus, in future, be a much more complete and reliable guide than formerly.

47. *Cotton Press Returns.*—The majority of Indian States have now introduced a Cotton Ginning and Pressing Factories Act so that the statistics of cotton pressed in India are becoming more complete and the check on production more reliable. The press returns have proved of great value in bringing to light discrepancies in the estimated production and have provided forecasting officers with the means of investigating wherein their estimates were at fault. The re-introduction of the complete rail-borne returns will be a further check and should enable the officers concerned to determine how much of any discrepancy there may be is due to the movement of cotton and how much to the faulty determination of yield or area. The Indian crop is invariably under-estimated, even more so than the press returns would indicate. The forecasts give an estimate of the total production whereas the press returns are for cotton actually pressed and omit the quantity used for domestic consumption which is estimated at $\frac{3}{4}$ million bales or at least 10% of the total crop. The chief causes for the discrepancies in Provincial figures are (1) faulty determination of yield, (2) wrong acreage figures and (3) movements of cotton. The last will not affect the all-India total when complete statistics of cotton pressed are available. The acreage figures are on the whole reasonably accurate though it has been found that much improvement is possible in certain areas. The determination of yield is the principal source of error and very

little can be done until the staffs of the Agricultural Departments are strengthened to provide a better reporting agency. The under-estimation of the crop in British India during the year amounted to 371,000 bales or 11% of the crop. In Gujerat there was a 32% excess of cotton pressed over the April final estimate. The Baroda and Navsari figures show a deficit of 28,000 bales compared with the forecast and it is very likely that some, if not all, of the excess in Gujerat is due to the cotton from these and neighbouring States. Sind pressed 71% more cotton than that estimated. The discrepancy here was due to two main factors (1) faulty estimation of the area and (2) imports from Indian States to the north. In the United Provinces the tendency is towards over-estimation which amounted to 20% as compared to 25% last year. In the Central Provinces there was an excess of 12% pressed over the estimate and in Berar there was an excess of 23%. The difference was due mainly to the character of the season experienced. Late rains carried the crop on much longer than normal and it gave a much heavier yield than was anticipated. The Punjab crop was under-estimated by as much as 41%, due mostly to the import of cotton from Indian States (few of which have presses) and partially to faulty yield determination.

48. *Imports of American cotton.*—The Committee continued to issue weekly circulars which gave the purchases for Indian mills of American cotton, the arrivals and the quantity at sea. The figures of purchases were compiled from the confidential voluntary advices supplied by importers and proved most accurate. Statistics of arrivals were prepared from the fumigation records while the estimates of the cotton at sea were derived from the compulsory advices under the Destructive Insects and Pests Act. The Committee is now in a position to give complete figures of the consumption of American cotton in Indian mills and was able to supply them to the International Federation of Master Cotton Spinners' and Manufacturers' Associations for inclusion in their half-yearly statement of consumption. In the past these were based on voluntary returns supplied by Millowners' Associations.

49. *Cotton consumption.*—The supply of the monthly statement of Indian cottons consumed in mills in India was continued. These were based on the returns under the Cotton Cess Act in the case of the mills in British India and from returns received direct from Indian States. The International Federation of Master Cotton Spinners' and Manufacturers' Associations will in future use these figures for the International Cotton Bulletin instead of depending on voluntary returns as in the past.

COLLECTION AND SUPPLY OF INFORMATION.

50. The Bombay Cotton Annual, published under the authority of the East India Cotton Association, Ltd., Bombay, was as usual supplied with the latest information regarding the area of improved varieties of cotton being introduced by the Agricultural Department as well as a considerable portion of its general information. An abridged note on the cotton work in the provinces is given in Appendix VIII.

51. The Committee has again to record its thanks to the British Cotton Industry Research Association for its weekly summary of current literature by which the Committee is kept abreast of the latest developments in cotton growing and technology, and also for the copies of the Shirley Institute Memoirs.

The Committee is also indebted to the Empire Cotton Growing Corporation for the supply to members of its proceedings, its reports and its Quarterly Review.

PUBLICATIONS.

52. The following bulletins have been published during the year :—

Technological Reports on Standard Indian Cottons, 1927.(Technologica Series No. 6.)

The Foundation of Yarn Strength and Yarn Extension. (Technologica Series No. 7.)

Research in Cotton Technology in India, 1927. (Technological Series No. 8.)

The Effect of Different Spindle Speeds on the Results of Spinning Tests. (Technological Series No. 9.)

The Effect of using Unbalanced Drafts instead of Balanced Drafts in the Spinning Preparation for Spinning Tests. (Technological Series No. 10.)

Technological Reports on Standard Indian Cottons, 1928.(Technologica Series No. 11).

SECRETARY'S TOURS.

53. Mr. Burt during his tenure of office paid visits to Poona, Indore Simla, Lyallpur, Khanewal, Shahjahanpur, Nagpur, Akola, Surat, Calcutta, Pusa, Karachi, Sakrand, Dharwar, Mahableshwar in connection with the work of the Committee.

I visited Mahableshwar and Simla to discuss Committee matters with the Royal Commission on Agriculture and with the Government of India.

FINANCIAL.

54. The financial year of the Committee does not coincide with the cotton year but runs from the 1st April to March 31st. In order, however, to bring the year's finances into line with the year's work, I quote below the receipts and expenditure during the year ending 31st August. Receipts amounted to approximately Rs. 7,34,369 and expenditure to Rs. 7,14,337. Owing to the difficulty of obtaining a botanist with the desired qualifications, the Madras Pempheres and Physiological Scheme was not started and the chief saving is under that head. For the current year the estimated expenditure is Rs. 8,04,707 and estimated receipts Rs. 7,41,000. The Committee has not yet been compelled to utilize any of its balances but when all the research schemes for which sanction has been given are in train it will be necessary to draw on them.

CHAPTER III.

RESEARCH.

55. One of the main functions of the Committee is to provide funds for research into the growing, marketing and technology of cotton. The Institute of Plant Industry at Indore, which derives its funds mainly from the Committee, is a central research institute for cotton problems, particularly those connected with the crop grown in the black cotton soils of Central India. Provision is also made to Provincial Departments of Agriculture for specific investigations sanctioned by the Committee. Technological research is under the direct control of the Committee and is carried out in the Technological Laboratory in Bombay.

56. The policy adopted by the Central Cotton Committee with regard to research is to finance cotton problems of an all-India nature, leaving the Provincial Departments of Agriculture to deal with those of purely local interest. A study of the investigations in hand will show that this policy has been closely followed except, from a certain aspect, in the case of the provincial botanical schemes, i.e., those dealing with the production by selection or hybridization of better yielding and more valuable strains to replace the existing types. At the time when these botanical schemes were first launched, most provinces were suffering from financial stringency and it was doubtful when Local Governments would be in a position to take in hand the work which the Committee decided to finance. Grants have been made to Bombay, Punjab, Madras and the Central Provinces, the chief cotton-producing provinces of British India, and another was sanctioned during the year for work in the Hyderabad State, the third largest cotton-growing tract of India. Another project for improving the United Provinces or Bengals cottons is under consideration. The Institute of Plant Industry, Indore, caters for the needs of the Indian States of Central India and Rajputana, while Baroda State reaps the benefit of work carried out in the Bombay Presidency. It will thus be seen that though each scheme is provincial in its application grants have been made for the improvement of the quality and outturn of the cotton grown in the greater part of India. The Mycological, Entomological and Physiological problems are common tc the greater part, if not to the whole, of India and their elucidation should have general application and be of great economic importance to cotton growers all over the country.

TECHNOLOGICAL LABORATORY.

57. The Committee's Technological Laboratory was opened to aid the experts in the several provinces, by conducting accurate spinning tests, in coming to a decision with regard to the merits of new varieties of cotton and also to undertake research into the properties and qualities of Indian cottons. Before the Laboratory was established such tests on samples were carried out by leading mills, but it was felt by the Committee that more

detailed reports were desired than the mills could give. The two branches of the work, viz., the Spinning Laboratory and the Research Laboratory, though discussed separately in the Director's report, are closely related, as the research work on the cotton fibre is intended to determine the relationship between its various characters and the value of the cotton for spinning. That the Laboratory is being utilized by Agricultural Departments in the testing of new varieties produced by them is evidenced by the increasing number of samples submitted. From the report of the Director, which will be found in the next chapter, it will be seen that the total number of samples tested was 133, 23 being for Agricultural Departments. The Laboratory is being utilized almost to its full capacity and the number of cottons tested is about the maximum possible.

58. In addition to the work on new varieties, tests have been carried out for a number of years on those improved varieties which are now grown on a commercial scale. This was originally undertaken to provide a basis for comparing the new strains, but the results have proved of great interest and value not only to the Agricultural Departments but to the trade generally. A study of the results obtained over a series of years will, it is hoped, throw a considerable amount of light on the causes affecting quality due to seasonal variation. Eighteen such standard cottons were tested and reported on during the year. Instead of issuing these in the form of a combined bulletin at the end of the season, a separate report on each cotton was published within about a fortnight of the receipt of the sample from the Agricultural Department. This action was greatly appreciated by the trade which was thus in a position to judge the likely performance of any particular variety almost as soon as it came into the market.

Six bulletins were published during the year. All have been very favourably reviewed in several scientific and textile journals in India, England and America. The Technological Laboratory has now fully established itself as one of the world's leading institutions of research in cotton technology and the reviews show the importance attached to the results obtained. An idea of the reception accorded to the bulletins is afforded by the reviews in the leading journals reproduced in Appendix IX.

THE INDORE INSTITUTE OF PLANT INDUSTRY.

59. The Indore Institute was opened in 1924. The initial years were devoted to the general layout of the farm and buildings and to the organisation of the Institute. This has now been completed and attention is being concentrated on the scientific side of the work. Considerable progress has been made in all branches, viz., the botany, physiology and cytology of the cotton plant. Methods have also been worked out and put into practice for dealing with surface water-logging of the soil and with the supply of nitrogen to the plant in the early stages of its growth. These are the two factors which tend to check growth. In the rain-fed cotton tracts of India, the yield is largely proportional to the rapidity of growth in the early stages

of the crop. The results obtained will be of fairly general application and will be of direct benefit to the tract of black soil which comprises the whole of Central India. The method of eradicating 'kans' and 'kunda' weeds devised at the Institute has aroused considerable interest and a large number of sets of implements has been sold. There has been a considerable development in the interest displayed by the Indian States of Central India and Rajputana and three more agreed to contribute during the year, viz., Barwani (Central India), Bikaner and Jhalawar (Rajputana). There are now thirteen contributing States which give annual grants amounting to Rs. 30,550 towards the upkeep of the Institute. Eight research students, appointed by the Committee, worked at the Institute during the year, four completing their training. One received an appointment as Junior Assistant on the staff of the Institute, another was employed under the Bombay Agricultural Department and a third was appointed to the Agricultural Department of the Bikaner State for work on cotton. One student sent by Hyderabad State for training in cotton breeding completed the course during the year. The Annual Report of the Director will be found in Appendix I.

Mr. Howard is due to retire from Government service in December, but the Indian Central Cotton Committee, in the interests of the work at Indore, has requested the Government of India to grant him an extension for a further period of two years.

GRANTS-IN-AID.

60. In addition to the Central Institute at Indore the Committee is financing thirteen research schemes in the main cotton Provinces of British India. They are as follows:—

Madras	2
Bombay	5
Central Provinces	2
United Provinces	1
Punjab	2
Sind	1

Classified by sciences they are:—

Cotton Breeding	5
Mycological	2
Entomological	3
Physiological	3

The grants are given to permit the employment of staff and equipment for a definite line of research approved by the Committee. Land and buildings are provided by the Local Governments. All were sanctioned in the first place for a period of five years, subject to revision and extension. Five completed their allotted span during the year and the summaries below will show the progress made and the decisions of the Agricultural Research Sub-Committee on each.

BOTANICAL SCHEMES.

61. *The Madras Herbaceum Scheme.*—Average annual grant Rs. 12,016 for five years. Commenced in 1923.

This scheme completes five years in December and will come up for review by the Agricultural Research Sub-Committee at the next meeting. The Director of Agriculture has asked for an extension for a further period of two years to permit of the strains evolved being given a thorough test on a field scale. The grant was given to obtain pure line selections of the Uppam (Herbaceum) type of cotton, suitable for growing in a tract of light rainfall. Four strains have been obtained which are all superior to ordinary Uppam in yield and equal or superior in spinning value and ginning percentage. Further testing is necessary to decide the best of these strains which will then be propagated as rapidly as possible for distribution. Mr. Hilson's previous selection of Westerns, known as Hagari 25, was grown in an area of 129,452 acres and the pure cotton fetched a premium of Rs. 20 per candy of 500 lbs. lint.

62. *Central Provinces and Berar Research Scheme.*—Average annual grant of Rs. 22,033 a year for five years (present grant Rs. 27,750). Started in 1923.

This scheme has completed its five years' term and the progress made was considered by the Agricultural Research Sub-Committee in July. The Committee sanctioned a renewal of the grant for a further period of five years, subject to review at the end of three years, to enable the work in hand to be completed. The objects of the scheme are (1) to obtain higher yielding and better quality cottons, immune to wilt disease, for the Central Provinces and Berar; (2) to study the causes of the poor yields in Berar and (3) to purify, by selection, the Chanda cold season *bani* cotton, of which about 10,000 bales are produced annually.

Dr. Youngman has practically decided to concentrate on the spread of one of his types—Verum 262—which has been sown on an area of 5,000 acres this year. This cotton has yielded well, has a ginning percentage of 35, is wilt-resistant, and is suitable for 20s (warp) counts. It received a premium up to Rs. 100 on Broach last year and was bought in by the local mills. In a few years Berar should be producing 20s cotton in commercial quantities. The purification of the Chanda 'Jari' cold season cotton and the elimination of the undesirable khaki lint have also been successful and seed of a pure white strain has been distributed. The third or physiological problem which comes under this scheme has made sufficient progress to allow some comment being made. The problem has been taken up from the manurial, rotational and water requirement points of view. In dry cultivation the profitable application of concentrated manures depends on the price of cotton. On the Akola Farm Dr. Youngman has worked out a method of utilizing cotton stalks which contain a comparatively high percentage of fertilizing material. Some very interesting results have been obtained in the

rotation experiments and when they have been carried out for a sufficient number of years some important conclusions are anticipated. Owing to the spread of the wilt disease in Berar, the growth of groundnut is being extended and has proved a very profitable crop for the growers. If cotton prices rule high, there is a danger that the area under groundnut will diminish with the introduction of a wilt-resistant variety. This will be almost a calamity because what the Berar cultivator needs is to incorporate a leguminous crop like groundnut in his regular farm practice. The chief factor in deciding the outturn is undoubtedly the amount and distribution of the rainfall, and experiments are in progress to find out more about the requirements of the plant in this respect and to work out means of effectively checking losses of moisture from the soil.

63. *Punjab Botanical Research Scheme.*—Average annual grant of Rs. 46,750 for five years. Work started in 1925.

This scheme is in its fourth year and was sanctioned for the purpose of investigating certain cotton problems under canal irrigation. Selection and cross breeding work is being done on both Punjab-American cotton and *desi*. In addition to evolving better and higher yielding strains of cotton, an investigation into the causes of the frequent failures, in certain areas, of the Punjab-American crop is being carried out. In certain years both the yield and quality of the cotton is poor and it would seem that this condition coincides with high atmospheric and soil temperatures at the time the plant is in flower. Further data is required to confirm this tentative conclusion. The rogueing of seed areas on several large estates is also supervised. This ensures that pure seed of the varieties it is desired to introduce is available in large quantities. The Committee provides the Cotton Research Botanist (Mr. Trevor Trought, M.A.,) a special staff and equipment for this work, although the Punjab Government has given considerable financial support for work on cotton.

64. *Dharwar Cotton Breeding Scheme on Upland Cottons.*—Average annual grant Rs. 12,083. Commenced in 1923.

This scheme was financed by the Committee with the object of improving the staple of Upland cotton by crossing it with Sea Island and there is every indication that success has been achieved. One strain appears to be desirable in all respects and is far superior to the present improved variety (Gadag No. 1) in staple length and ginning percentage. It will now be tested for yield in replication with Gadag 1. The Dharwar Upland cotton is the only American cotton which has survived after many attempts to introduce exotics into the non-irrigated cotton tracts of India. The Agricultural Department has already replaced the old mixture by a pure type—Gadag 1—which is now grown in a large area around Gadag, a tract which is much more suited to the early maturing Upland than the longer-growing Kumpta. The Agricultural Research Sub-Committee decided that this scheme should be financed for a further period of five years subject to revision at the end of three years.

65. *Khandesh Cotton Breeding Scheme.*—Average annual grant of Rs. 5,000 for five years. Started in 1925.

The grant for this scheme was given to enable extra staff to be employed for the furtherance of the work of testing some crosses made several years ago by the Agricultural Department. During the year under review Dhulia I and Dhulia II were given a thorough test with N.R. as the stock variety. The former was found to be slightly superior in yield to N.R. and tests made at Matunga show that it is capable of spinning 20s counts as compared with 8s to 10s obtained from N.R. Dhulia II was found to be susceptible to wilt disease and has therefore been rejected. Dhulia I was free from the disease but further testing is necessary to decide this last property. Yield trials were carried out on the Government farm and also on cultivators' fields and were very satisfactory. Another promising strain- B.XXI—which spins 30s and has a ginning percentage of 35, will be given a thorough test for yield and wilt resistance.

COTTON DISEASES.

66. Wilt is the principal disease of the cotton plant in India and though considerable work has been done on it, there is still some doubt as to its cause. The Committee therefore decided in 1923 to finance two schemes in two different tracts where the disease was prevalent in order that a thorough investigation might be made and remedial measures suggested. Both the schemes have completed their five years' term during the year.

67. *Dharwar.*—Average annual grant Rs. 12,083. Commenced in 1923.

The Bombay Karnatak is peculiarly susceptible to the ravages of this disease and it was decided that an investigation should be undertaken under the conditions pertaining in this very important cotton growing area. The constant association of the *Fusarium* fungus with the wilted condition of the plants led the investigators to assume that it is the cause of the disease and all work carried out was directed to discovering ways and means of combating this fungus. Experiments led to the conclusion that the factor which caused *wilt* was not the clogging of the vascular ducts by the mycelium of the *Fusarium* but was a chemical substance or toxin emitted by the fungus. Methods devised for reducing the incidence of the disease consist of hot weather cultivation which exposes the fungus in the soil to the high temperature of the sun and the use of farmyard manure, but most marked success has been achieved by the production of wilt-resistant varieties. A cross raised appears to be satisfactory because in addition to wilt resistance, it has a high ginning percentage and satisfactory spinning qualities. Other promising strains of a cross between Kumpta and Wagale are being worked out and will require time for thorough testing. The Agricultural Research Sub-Committee decided that the grant for this scheme should be continued for a further period of five years, subject to review at the end of three years

in order that the production of wilt resistant varieties should be proceeded with. The Sub-Committee agreed that further investigation should be made into other remedial measures but they decided that the staff should concentrate on the production, purification and testing of wilt-resistants trains, which, they considered, was the most fruitful method of fighting the disease.

68. *Central Provinces Cotton Wilt Scheme.*—Average annual grant Rs. 5,133. Started in 1923.

In the important cotton tract of Berar, wilt has for long been the principal bugbear of the cultivator and the improved variety (Roseum) introduced by the Agricultural Department is very susceptible. The success which has attended the introduction of the groundnut crop in Berar is chiefly due to the desire of the grower to find something to replace his wilted cotton. Mr. J. F. Dastur, Mycologist to Government, Central Provinces, undertook to work out a physiological aspect of the cotton wilt problem, and the Committee sanctioned a grant to provide for additional staff and equipment. The grant was first given in 1923 so that the scheme has now completed five years. Mr. Dastur confined his attention to a study of the wilted condition of cotton plants and came to the conclusion that this condition was not pathogenic but physiological. The Agricultural Research Sub-Committee considered that this investigation was mainly of academic interest and was not likely to lead to anything of practical value. It was decided therefore to close down the scheme.

COTTON ENTOMOLOGY.

69. The Committee is financing three entomological schemes in three provinces, two into the Pink Boll-worm (*Platyedra gossypiella*) and one into the Earias Boll-worm (*Earias fabia* and *Earias insulana*).

70. *United Provinces.*—Total capital grant Rs. 54,000. Present annual grant Rs. 16,000. Commenced in 1925.

Mr. Richards at Cawnpore has proved that if the cotton crop of the United Provinces is protected from the Pink Boll-worm, the yield is increased considerably and the quality greatly improved, owing to absence of stain. The elimination of the boll-worm is achieved by heat-treating the seed, which kills the larvæ of the boll-worm. Experiments with heat-treated cotton seed sown in an isolated area of 500 acres have been completely successful over a number of years. Only a few details regarding carry-over in alternative host plants require to be worked out and these are expected to be completed in the next cotton season. Experiments are being carried out with special safety devices on two heat-treating machines to prevent loss of the seed due to overheating. Owing to pressure of other work this part of the programme could not be carried out this year. The benefit to the grower will be at least Rs. 30 an acre and the cost of treating the seed should not exceed three annas an acre. In order to be completely successful, it

will be necessary to treat all seed used for sowing and for feeding because re-infection of a treated crop is possible even from a small store of untreated seed. The flight range of the moth is also considerable so that re-infection of a crop is possible from untreated seed or cotton several miles off.

71. *Punjab.*—Initial grant Rs. 6,000. Average annual grant Rs. 15,533. Commenced in 1926.

This scheme has been running for two years. The Pink Boll-worm is a serious pest in the South-east Punjab but at present does little damage in the Canal Colonies. This investigation was undertaken to throw some light on the cause of the difference in the two tracts. There are indications that the limiting factor is the temperature. Beyond 35° C. it was found that the eggs of the moth died and the intensity of attack is proportional to the number of days during July and August when the maximum temperature is below 35°. If further work proves this to be the correct solution of the phenomenon, there is little fear that the Pink Boll-worm will become a serious pest in the Canal Colonies of the Punjab or in any other tract, e.g., Sind where high temperatures are recorded in July and August.

72. *The Earias Boll-worm Scheme—Surat.*—Average annual grant Rs. 16,000. Commenced in 1923.

This investigation has yielded a considerable amount of exact knowledge concerning all stages of the life history of the spotted boll-worm. One important discovery, viz., that the moth laid its eggs only during the night, led to the method of night caging by which means a crop was grown free from infection and yet did not suffer from the abnormal growth usually found when plants are grown in permanent cages. The boll-worm is responsible for a reduction in the number of bolls from 11 to 50 per cent. in different seasons, although in the long-growing Surat area this loss appears to be made good. Night caging makes the crop earlier by about six weeks. Another important point was that the *larvæ* invariably pupate in the soil which they enter through cracks. This led to the discovery that a fine mulch on the surface of the soil prevents moths from reaching the surface after emergence. The work now being carried out is to find a satisfactory method of making a mulch right up to the stems of the plants. The use of calcium arsenate as a poison dust is encouraging but it induced an attack of *aphis*. This, however, appears to be remediable and further work will be carried out next year. The investigation showed that it is mainly the new sprouts from the cotton sticks left in the soil that harbour the carry-over of the worms from season to season. Attention is being paid to the clearing of all cotton sticks and stubble immediately after harvest and the practical side of the question is being worked out. The Agricultural Research Sub-Committee decided that this scheme should be extended for a period of two years, subject to review in July 1929, to give time for the practical measures to be worked out.

COTTON PHYSIOLOGY.

73. *Surat Research Scheme.*—Average annual grant Rs. 24,933. Commenced in 1923.

The shedding of buds, flowers and bolls is a very serious factor in the growth of the cotton crop and any method which would prevent even a small percentage of these losses would be of great benefit to the grower. Ordinarily only up to 10 per cent. of the flowers develop into mature bolls and this scheme was originated in order to study the causes for the large losses of flowers and bolls and to devise means of preventing them. Apart from the shedding due to the spotted boll-worm, the investigators have come to the conclusion that the loss is caused by physiological and environmental factors, the principal one being the lack of elaborated plant food due to interaction of the growth processes of the plant. The remedial methods being experimented with are (1) controlling the water-supply in the soil at the critical period of growth by throwing the soil into ridges, (2) wide planting of the crop, (3) stimulating growth by applying manures and (4) the breeding of a more efficient plant. The cumulative effect of these measures is expected to give a hundred per cent. increase in the crop. The Agricultural Research Sub-Committee decided that the scheme should be extended for a further five years, subject to revision at the end of three years, in order that the experiments devised to test the above conclusions should be thoroughly carried out.

74. *Madras Pempheres and Physiological Scheme.*—Average annual grant Rs. 55,000.

The Cotton Stem Weevil (*Pempheres affinis*), at one time considered to be a minor pest, shows signs of becoming a major pest both in Madras and in other parts of India. The Committee sanctioned a grant to permit investigation into methods of control. One promising line is the study and production of strains which show resistance to attack and a marked power of recovery. Provision has been arranged for work on both the botanical and chemical aspects of the subject. In addition, the work on bud, flower and boll shedding undertaken and carried to a certain point by the Cotton Specialist to the Madras Government will be continued. Owing to the difficulty of obtaining a Physiological Botanist with the necessary qualifications to take charge of the scheme, no work has been carried out, though funds were sanctioned two years ago. It has been found necessary to offer an increased salary in the hope of securing an experienced officer.

75. *Sind Research Scheme.*—Average annual grant Rs. 20,000. Started in July 1927.

The opening of the Sukkur Barrage and the change from inundation to perennial irrigation will mean a revolution in the traditional methods of agriculture in Sind. The Bombay Government opened an experimental farm at Sakrand in order that the problems which are likely to arise from the regular supply of water should be studied in advance. The standard

money crop under the Barrage will be cotton and the regular supply of irrigation will permit a better variety being grown than in the past. The Agricultural Department is devoting attention to agronomic, botanical and physiological problems. The physiological investigation is being financed by the Committee, for the employment of staff and equipment, to study the water conditions under which the best cotton can be grown.

76. The Balance Sheet in Appendix X gives the amount that has been spent on research generally and on each scheme since its inception up to the 31st March 1928. A substantial amount under the provincial schemes has been spent on apparatus and equipment* which will be transferred from one scheme to another when necessary.

RESEARCH STUDENTS.

77. Another important function which the Committee is performing is the training of research workers in several of the sciences pertaining to raw cotton by the grant of scholarships to distinguished graduates in Science of Indian Universities. These men are placed under the guidance of experienced investigators working on one of the Committee's schemes or Institutes and are given a definite problem to work out. In this way the Committee has trained up a corps of specialists in different branches of the industry, many of whom have been absorbed by the Committee and others have been taken by Provincial Departments of Agriculture. The scholarships amount to Rs. 150 a month (with a local allowance for those working in the Technological Laboratory, Bombay,) and Rs. 1,38,632 have been spent under this head in the five years up to the 31st August 1928. The studentships are normally held for two years, although they are frequently extended for another year if the piece of work on which the student is engaged requires it.

The number of research students who have been given scholarships is 39, of whom 14 are still under training. Of those who have completed their training, 19 have been given appointments on the Committee's staff or have joined Provincial and State Agricultural Departments ; 4 resigned before completion of their terms. Details of all students trained will be found in Appendix XIII.

J. H. RITCHIE.

* Appendix XI.

CHAPTER IV.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1927-28.

THE report is divided into four sections :—

I. Spinning Laboratory.

II. Research Laboratory.

III. Publications.

IV. General.

I. SPINNING LABORATORY.

The Spinning Laboratory has been fully employed during the year under review. The activities of this Laboratory have been almost equally divided between tests on standard Indian cottons and tests on samples submitted by Agricultural Departments. During the year 133 samples were received; of these 105 were for spinning tests. The corresponding figures for 1926-27 were 136 samples received, and 120 for spinning tests. During the present year 22 Spinning Test Reports (Nos. 46-67) and one Fibre Test Report (No. 8) have been issued to Agricultural Departments as compared with 19 Spinning Test Reports (Nos. 27-45) and 5 Fibre Test Reports (Nos. 3-7) in 1926-27. The following table shows in summary form the distribution of the samples tested in each of the four years during which the Spinning Laboratory has been in operation :—

Sample Distribution List.

Provinces.	Samples.					Lots.					Yarns Spun.				
	1924-25.	1925-26.	1926-27.	1927-28.	Totals 1924-28.	1924-25.	1925-26.	1926-27.	1927-28.	Totals 1924-28.	1924-25.	1925-26.	1926-27.	1927-28.	Totals 1924-28.
Bombay	18	26	22	22	88	36	52	44	44	176	103	152	132	132	519
Punjab	14	1	..	..	15	26	4	..	..	30	106	14	..	..	120
United Provinces.	7	..	6	11	24	14	..	12	22	48	27	..	36	66	129
Madras	2	19	48	25	94	4	38	96	50	188	12	108	266	150	536
Central Provinces.	2	..	3	2	7	3	..	6	4	13	8	..	18	12	38
Miscellaneous ..	3	11	..	6	20	3	22	..	12	37	3	58	..	36	97
Totals ..	46	57	79	66	248	86	116	158	132	492	259	332	452	396	1,439
Standard Cotton Tests ..	8	54	49	64	175	34	176	142	178	530	95	514	423	447	1,479
Total Tests ..	54	111	128	130	423	120	292	300	310	1,022	354	846	875	843	2,918

Note.—Each sample of cotton submitted for test is normally divided into two lots, each of which is then spun into three different types of yarn.

The following is a list of standard cottons referred to in the table on page 36; the figures in brackets after the name of each cotton show the season for which the cotton was first tested as a standard :—

Bombay Standard Cottons.

1. Dharwar 1 (Kumpta) (1923-24).
2. Gadag 1 (Dharwar-American) (1923-24).
3. Surat 1027 A.L.F. (1923-24).
4. Wagad 4 (1925-26).
5. Wagad 8 (1925-26).

Punjab Standard Cottons.

6. Punjab-American 4F (1924-25).
7. Punjab-American 285F (1923-24).
8. Punjab-American 289F (1924-25).
9. Mollisoni (Punjab *desi*) (1925-26).

United Provinces Standard Cottons.

10. Aligarh A. 19 (1924-25).
11. Cawnpore K. 22 (1924-25).
12. Bundelkhand J. N. 1 (1924-25).
13. Cawnpore-American C.A. 9 (1924-25).

Madras Standard Cottons.

14. Coimbatore Co. 1 (Cambodia 295) (1923-24).
15. Nandyal 14 (Sircar 14) (1923-24).
16. Hagari 25 (Sircar 25) (1923-24).
17. Karunganni 6 (1923-24).

Hyderabad Standard Cotton.

18. Umri Bani (1924-25).

American Standard Cottons.

19. Mississippi (1923-24).
20. Memphis (1925-26).
21. Texas (1923-24).

As a general rule, 50 lea tests, 100 single thread tests, and 100 twist tests, are made on each type of yarn spun from a non-standard cotton, and 50 lea tests, 200 single thread tests, and 100 to 200 twist tests, are made on each type of yarn spun from a standard cotton ; it follows that the testing of the yarns spun in 1924-25 involved about 170,000 individual yarn-tests, whereas for the yarns spun in each of the years 1925-26, 1926-27, and 1927-28, the total number of tests required was nearly half a million. Thus it will be seen that the Spinning Laboratory and the Testing Laboratory attained practically their maximum capacity in 1925-26.

Tests for Agricultural Departments.—The following is a statement of cottons tested for the various Agricultural Officers :—

BOMBAY.

(1) *Cotton Breeder, Dharwar :*—Six samples of Dharwar cottons, four being new types for comparison with Dharwar 1 and Gadag 1.

(2) *Cotton Superintendent, S.M.C., Dharwar :*—Three samples, one being a new type for comparison under field conditions with ordinary Kumpta and Dharwar-American.

(3) *Special Cotton Mycologist, Dharwar :*—Four samples, one pair consisting of Dharwar 1 grown under no-wilt and high-wilt conditions ; and the other pair of a new type for comparison with Gadag 1.

(4) *Cotton Breeder, South Gujerat, Surat :*—Four samples, two being new types and the other two being local Broach cottons.

(5) *Superintendent, Government Farm, Jalgaon :*—One sample of a new type of Dhulia cotton.

UNITED PROVINCES.

Assistant Economic Botanist, Cawnpore :—Eleven samples, consisting of three new types—two of which were grown in three different localities and the other in four different localities—for comparison with local Cawnpore cotton.

MADRAS.

(1) *Cotton Specialist, Coimbatore :*—(*i*). Two samples of Cambodia cottons. (*ii*). Six samples of Uppam cottons, four being new selections. (*iii*). Two samples of Cambodia 440, one early and one late. (*iv*). Six samples of Uppam cottons, the same types as (*ii*) above but grown under different conditions. (*v*). Two samples of Uppam cottons.

(2) *Assistant Cotton Specialist, Koilpatti :*—Three new types of Karunganni cotton.

(3) *Agricultural Demonstrator, Tirupur :*—Two samples of Cambodia cotton grown under field conditions.

CENTRAL PROVINCES.

Economic Botanist, Nagpur :—One sample of *Verum* cotton.

HYDERABAD.

Superintendent, Government Main Farm, Parbhani :—Four samples of Hyderabad cottons.

INDORE.

Director, Institute of Plant Industry :—Two samples of Barwani cottons.

The cottons which have been chosen as standard Indian cottons are those more or less recent Agricultural Department selections which have been introduced into cultivation on a commercial scale. The work on these standard cottons is of importance from several points of view. In the first place, it furnishes the necessary standards by which to judge new cottons; secondly, it provides Agricultural Departments not only with information which they did not previously possess of the capacities of the cottons but also with annual test-results showing to what extent quality has varied from that of previous seasons; thirdly, it provides the cotton trade with very valuable information which has a definite bearing on the marketing values of these cottons. Furthermore, through the combined work in the Spinning and Research Laboratories, the results of spinning tests and fibre measurements are being accumulated for various cottons, and it is by the investigation of these results that it is hoped to solve the problem of their interrelationship.

Standard Indian Cottons, 1926-27 and 1927-28.—Two editions of "Technological Reports on Standard Indian Cottons" have been issued during the past year; the first, Bulletin No. 11, Technological Series No. 6, containing the results for the cottons of 1926-27 and previous seasons, was published in November 1927; and the second, Bulletin No. 16, Technological Series No. 11, which included also the results for the cottons of 1927-28 season, was published in June 1928. The much accelerated publication of the results for the 1927-28 cottons had its inception in a discussion which took place in the Technological Research Sub-Committee in January 1927, as a consequence of which the supply of the standard cottons to the Technological Laboratory and the testing of them were much accelerated; and the thanks of the Committee are due to the various Agricultural Officers and others for their ready co-operation in the early supply of the different cottons. In order that the reports might have the utmost possible utility, the report on each staple cotton grown in appreciable quantity was also published separately as soon as possible after the receipt of the cotton in the Laboratory —usually within a fortnight thereof. These separate reports were issued on the following cottons, the month of issue being shown in brackets following the name of the cotton :—

Umri Bani (December, 1927).
Punjab-Americans 4F and 289F (January 1928).
Surat 1027 A.L.F. (March 1928).
Dharwar 1 (April 1928).
Gadag 1 (April 1928).
Coimbatore Co. 1 (Cambodia 295) (April 1928).
Hagari 25 (May 1928).

It is gratifying to record that from the demand which sprung up for the separate reports it appears that they have been much appreciated by the cotton trade. Instead of issuing separate reports on Nandyal 14 and Karunganni C7—the last standard cottons to be received—arrangements were made for the issue of the complete Bulletin No. 16, "Technological Reports on

Standard Indian Cottons, 1928," as soon as possible after the receipt of these cottons. In Bulletin No. 11, results for two new standard cottons, Wagad 4 and Wagad 8—representing the Dholleras crop—were included for the first time, results being given for the seasons 1925-26 and 1926-27. Many other new features were incorporated in this bulletin. Various agricultural details were given showing for each cotton its botanical species, its relation to the commercial crop of the district, the conditions of its growth, its yield, and the area under cultivation. Certain fibre measurements, not previously made on the standard cottons, were made on the cottons of the 1926-27 season: the additional characters measured were the fibre-strength, the fibre-weight, and fibre-rigidity. A table was included to show in summary form the fibre-properties of the 1926-27 cottons. Attention was also directed to the fact that the cottons of the 1926-27 season had been spun at a higher speed than those of previous seasons; and that new methods had been introduced in the determination of yarn twist, and single thread strength and extension. In order to make room for the results of the tests on the 1926-27 cottons it was found necessary to omit the results for the 2-lb. samples of the 1923-24 (or 1924-25) cottons; the latter results had been given in the two previous editions of this bulletin.

The section of the introductory note devoted to a general discussion of the results was considerably expanded so as to include a discussion of: (1) the characteristics of the standard Indian cottons; (2) the seasonal variation displayed by these cottons; and (3) the relation between fibre characters and spinning value.

Very few changes were made in Bulletin No. 16 as compared with Bulletin No. 11. An additional item, the growing period, was included in the agricultural details given in the report on each cotton. A slight change was made in the selection of counts of yarn to be spun; and the paragraph on evenness was slightly expanded so as to include an explanation of the fundamental difference between the evenness of yarn and the regularity of its strength. A new section was added to the general discussion of the results, and was devoted to a brief review of the results obtained for the cottons of 1927-28. In order to make room for the results of the tests on the 1927-28 cottons in the tables of spinning test results, it was found necessary to omit the results for the 5-lb. samples given in the earlier editions; and for this reason the section of the general discussion of the results, previously included to deal with the minimum weight of cotton needed for a trustworthy spinning test, which was based partly on the results obtained for the 5-lb. and 2-lb. samples, was also omitted; and as the sample of Karunganni tested in 1923-24 was C8, having quite different properties from the strain C7 supplied in subsequent seasons, the results for C8 were omitted.

The chief points brought out in the general discussion of the results in Bulletin No. 16 are referred to in a short summary under Section III, " Publications." Summaries of the fibre test results and the spinning test results are given on pages 55 and 57 respectively.

Commercial Standards.—During the past year an investigation has been begun to determine the blow-room loss and card-room loss sustained by a number of standard commercial cottons. We are much indebted to the East India Cotton Association for their co-operation in this work, and for kindly arranging for the supply of bales of the following cottons :—

Punjab-American : Fine, and Superfine.
C. P. No. 1 (Oomras) : Fine, and Superfine.
U. P. (Bengals) : Fully Good, Fine, and Superfine.
Rajpipla (Surat 1027) : Fully Good, Fine, and Superfine.
Hubli (Coompta) : Fully Good, Fine, and Superfine.
Gadag Upland (Dharwar-American) : Fully Good, and Fine.
Karunganni : Fully Good, and Fine.

A number of these cottons have already been tested, and it is hoped that it will be possible to publish the results of the investigation at an early date.

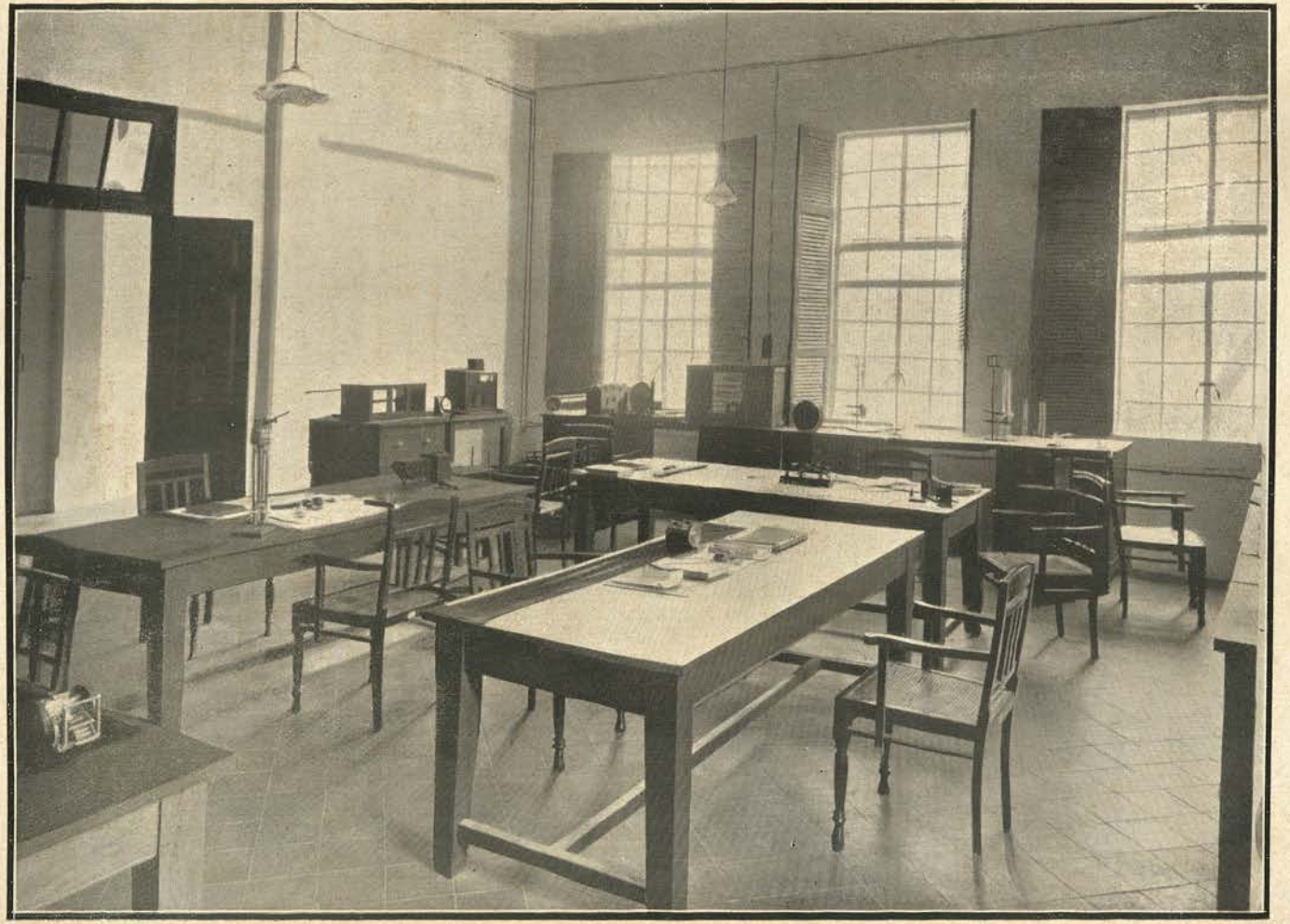
The facilities offered at the Laboratory have again proved of considerable value in connection with a matter which has caused much concern to a section of the cotton trade during the past season, viz., *the quality of Rajpipla cotton.* Some years ago this cotton was almost a drug on the market, but after the State took steps for the introduction of the Surat 1027 variety, and for the State control of ginning factories, besides maintaining a law on the lines of the Cotton Transport Act, the credit of Rajpipla cotton rose until it actually commanded a high premium over Broach. But early in the past season it was rumoured that the quality of Rajpipla cotton had deteriorated owing to the admixture of *Goghari* cotton, an inferior variety. As indicated in the list above, three bales of Rajpipla cotton were supplied to the Technological Laboratory, through the East India Cotton Association, in connection with the tests being carried out on the blow-room loss of Indian cottons ; one firm supplied bales of Superfine and Fully Good Rajpipla, and another firm supplied a bale of Fine Rajpipla. It was ascertained from these firms at a later date that they considered these bales to be typical bales of Rajpipla cotton of the whole season. In order to ascertain whether the cotton in these bales showed any signs of deterioration, they were subjected to a series of spinning and fibre tests. The results obtained for them were found to be almost identical with those for the standard cotton Surat 1027 A.L.F. of the season, supplied by the Government Farm at Surat. In order to put the matter to a further test, a sample of what was reported to be inferior Rajpipla cotton was obtained in the middle of July ; this proved to be slightly inferior to the other samples and to the Farm Surat 1027 A.L.F., but there was nothing whatever to show that its inferiority was due to the admixture of *Goghari* cotton rather than to the commonly occurring variation which results from comparatively small differences in the locality or conditions of growth. A " Technological Report on Rajpipla Cottons " was accordingly published in order to bring these facts to the notice of the trade. It is hoped that by carrying out similar tests on Rajpipla cotton in future seasons as

soon as the cotton begins to come into the market and by publishing the results immediately, some assistance may be rendered to the grower in the direction of obtaining for his cotton a premium in accordance with its quality.

Humidity and Temperature in Spinning.—Some further tests have now been carried out on the effect of humidity and temperature on cotton spinning. In Bulletin No. 9, Technological Series No. 4, it was emphasized that the results were only intended to apply to such conditions as were likely to arise in Bombay. In order to make the tests cover the range possible in other parts of India it was necessary to choose a period for the further tests when the external conditions were both cold and dry ; under these conditions the resources of the Spinning Laboratory make it possible to reproduce very effectively the conditions often experienced in up-country mills. Such conditions prevailed in February, and the opportunity was therefore seized to make the further tests on the two cottons, Memphis-American and Nandyal 14. These cottons were prepared and spun under (1) normal conditions, i.e., conditions of about 80° F. and 65 per cent. R.H. ; (2) hot-dry conditions, i.e., conditions of about 100° F. and 25-30 per cent. R.H. ; (3) medium-dry conditions, i.e., conditions of about 92° F. and 35 per cent. R.H. ; and (4) monsoon conditions, i.e., conditions of about 92° F. and 72 per cent. R.H. These tests completely confirmed the previous tests so far as concerned the medium-dry, normal, and monsoon conditions; under the hot-dry conditions, however, difficulties were experienced in the second head of drawing. These difficulties were reflected in the properties of the yarns, as in general the weakest yarns were obtained when the cotton was spun under these hot-dry conditions. In these experiments a check on the humidity was obtained by actually determining the percentage moisture content in samples taken at different stages. It is hoped to publish a bulletin dealing with these tests at an early date.

Drawing Tests.—A good deal of progress has been made in the investigation of the effect of passing cotton through either one or two heads of drawing only instead of through three heads in the spinning preparation. The ordinary spinning procedure in the Technological Laboratory involves only two heads of drawing ; in order to determine experimentally how far this procedure is justified, tests have been made in which a 30-lb. sample of a cotton after being carded was divided into six lots ; two of these lots were passed through one head of drawing, two were passed through the normal two heads of drawing, and the remaining two lots were passed through three heads of drawing. In all, ten cottons have been used in these tests ; the full results will be published in bulletin form in due course.

The results of other work in the Spinning and Testing Laboratories have now been published, and a summary of the relative bulletins is given in Section III under the heading " Publications."



Fibre Testing Laboratory.

The new methods adopted in yarn testing for the determination of twist, and of the counts of yarn in the single thread tests for strength, have proved quite satisfactory; they were first employed on the standard cottons of 1926-27, and in view of their success were then adopted for all cottons. Ballistic tests have been carried out on the standard cottons of 1926-27 and 1927-28; the results obtained present a number of interesting features and will form the subject of a forthcoming bulletin.

II. RESEARCH LABORATORY.

Fibre-Testing Section.—It is a function of this section to make fibre tests on all the cottons which are subjected to spinning tests, and most of the time of the members of the staff working in this section is occupied in this way. In some cases, however, cottons are received in quantity which is insufficient for spinning tests, and in such cases it is the custom to make fibre tests only. The routine tests comprise the determination of fibre-length and fibre-length distribution, the fibre-weight per inch, the fibre-strength by both the O'Neill method and the Balls Magazine Hair Tester, the fibre-rigidity, the fibre-width, and the number of convolutions per inch. In addition to these tests some experiments have been made on the clinging power of cotton, with a view to clearing up some of the anomalies referred to in " Technological Reports, 1928. " The work on fibre-testing is probably the most arduous work which is done in the Laboratory; it is work which in the nature of the case must be carried out comparatively slowly, and it is work, moreover, which involves a good deal of eye-strain for those engaged in it. It is the time taken for the fibre-tests which practically determines the speed with which the complete testing of a succession of samples can be carried out at the Laboratory. The fact that it proved possible to issue " Technological Reports, 1928 " by the middle of June must be attributed in large measure to the very willing co-operation of the members of the staff in this section during the hottest part of the year.

One of the facts revealed by the further investigation of the fibre-properties of the standard Indian cottons, as reported in " Technological Reports, 1927 " was that the Punjab-American 4F and Mollisoni cottons differ very widely in fibre-weight and fibre-rigidity. Now great damage has been done to the reputation of the Punjab-American cotton by the prevalent mixing with it of the inferior *desi* cotton, and one of the chief difficulties in the situation has been the impossibility of suitably penalizing the practice owing to the absence of a reliable method of determining the percentage of inferior cotton present. It appeared possible, therefore, that advantage might be taken of the differences in fibre-weight and fibre-rigidity not only to detect whether mixing had taken place in any given sample of cotton, but also to detect approximately the extent of any such mixing. This possibility depended on these properties not being greatly affected by district or seasonal differences; but from subsequent results published in " Technological Reports, 1928, " it became clear that seasonal differences at any rate may be very great. However, before these results were available a special investigation of the matter was started on a dozen different samples

of Punjab cottons—4F, Mollisoni, and *desi*—which had been grown under various conditions by the Cotton Research Botanist, Lyallpur, who kindly supplied these samples. All these cottons were tested for the property of fibre-weight, but although very striking differences were exhibited between the Punjab-American and the *desi* types, there was considerable variation in the property for any particular variety according to the conditions under which it had been grown. Evidently, therefore, the method cannot be applied directly to determine the percentage of mixing. An attempt was then made by a modification of the method to separate the varieties in a mixture of the two, but owing to the close similarity of their staple lengths this also proved unsuccessful, so that the problem still remains unsolved.

Chemistry Section.—The chief work carried out in this section has been the determination of some of the chemical constituents of the standard Indian cottons of 1926-27 and 1927-28, viz., the ash left by each cotton on combustion, and the nitrogen, phosphorus, and wax contents of the cottons—including the determination of a number of constants for each wax (melting-point, iodine value, and saponification value).

Physics Section.—The experimental part of a long investigation of the fibre-length, fibre-strength, fibre-rigidity, fibre-width, and fibre-convolutions of Surat 1027 A.L.F., 1925-26, has now been completed. Many fibre-strength tests have also been made on Punjab-American 289F, and Aligarh A. 19. This work has for its object the study of the inter-relation between the various properties, and it is expected to throw much light on sampling for fibre-tests, particularly on the question as to the minimum number of observations required for a satisfactory mean value for any one property. The statistical analysis of all the experimental data has been taken in hand, but being a very laborious process it will take some months to complete.

Another investigation which has been completed relates to the variation in complete bobbins of grandrelle yarns, and the comparison of the new routine method of twist-testing, based on the making of a grandrelle yarn at the top of each bobbin, with the ordinary method of twist-testing for single yarns. This work established the great superiority of the new method of twist-testing, and it is hoped to publish a bulletin on the subject shortly. The investigation of the variation of the counts and strengths of yarns has also made much progress, and it is hoped that the statistical treatment of the results will be completed within the next few months.

An intensive investigation of the relation between the fibre properties and yarn properties has been started during the past year. Various counts of yarn of a number of cottons are spun with different twists and their breaking strengths determined : afterwards a determination is made of the count of the portion of yarn broken, the number of fibres in the cross-section, the fibre-weight per inch of the cotton, and the number of broken fibres in the broken yarn. This investigation is thus an attempt from another angle to determine the parts played by the different fibre-properties in the strength of yarn.

General.—An investigation has been made of samples of textiles recovered from the archaeological excavations at Mohenjo-daro in Sind. The first sample was a small fragment of fabric measuring only one-tenth of an inch by three-tenths of an inch. It proved to be a cotton fabric, weighing about 2 ozs. per square yard, made out of 34's counts warp and weft, and containing 60 ends per inch and 20 picks per inch. Later two other samples—small portions of strings—were found in some pieces of earthenware; the first was a 24-fold cotton cord, composed of two cords each containing twelve strands of 18's counts; the second sample was also a 24-fold cotton cord made by the twice doubling of 6-fold cords, the count of each of the six single strands being 14's. A full account of these samples is being prepared in a "Note on the Early History of Cotton."

III. PUBLICATIONS.

The following is a list of Publications which have been issued during the year:—

(1) "Technological Reports on Standard Indian Cottons, 1927." Bulletin No. 11, Technological Series No. 6, November 1927.
(2) "The Foundations of Yarn Strength and Yarn Extension. Part I. The General Problem. Part II. The Relation of Yarn Strength to Fibre Strength." Bulletin No. 12, Technological Series No. 7, March 1928.
(3) "Research in Cotton Technology in India, 1927." Bulletin No. 13, Technological Series No. 8, April 1928.
(4) "The Effect of Different Spindle Speeds on the Results of Spinning Tests." Bulletin No. 14, Technological Series No. 9, May 1928.
(5) "The Effect of using Unbalanced Drafts instead of Balanced Drafts in the Spinning Preparation for Spinning Tests." Bulletin No. 15, Technological Series No. 10, June 1928.
(6) "Technological Reports on Standard Indian Cottons, 1928." Bulletin No. 16, Technological Series No. 11, June 1928.

A number of articles have also been contributed to the local Press dealing with the results obtained at the Technological Laboratory. As in previous years, a contribution has been made to the *Bombay Cotton Annual* reviewing the work of the Laboratory during the year.

The changes made in "Technological Reports on Standard Indian Cottons, 1927" have already been referred to; the following is a summary of the more salient features of Bulletins Nos. 12-16:—

"*The Foundations of Yarn Strength and Yarn Extension.*"—This paper is the first of a series dealing with the fundamental problem of the Research Laboratory, viz., the relation between the properties of a cotton and its spinning value, the spinning value itself being measured to a large extent by the strength of the yarn which can be made from the cotton. The first two parts which together form this paper are chiefly directed to clearing the

ground ; the work which has been done in the past is reviewed, and a list is given of those factors which appear to enter into the problem. Part I consists of a statement of the general problem, wherein it is pointed out that ultimately the values which may be obtained for the strength and extension of a yarn depend on : (1) the fibre characters, (2) features of yarn structure, (3) sampling methods and errors, and (4) the conditions of testing. In Part II reference is made to the question whether a yarn breaks by fibre-fracture or by fibre-slippage. After a discussion of previous work, new results are given for 12 standard Indian cottons and 2 American cottons, showing that for these cottons, on the average, about 50 per cent. of the fibre strength is realized in the single thread test on the yarn, and about 35 per cent. in the lea test.

The factors affecting the relation of yarn-strength to fibre-strength are discussed in considerable detail ; it is emphasized that a complete expression for yarn-strength must take cognizance of three facts : first, that experience shows that differences in strength between different varieties of cotton are of great importance in spinning ; secondly, that there is a great variety of twist in different kinds of commercial yarns ; and thirdly, that warp yarns in the loom are generally used in the sized state. Detailed reference is made to the mode of transmission of tension in a yarn, the boundary effect (i.e., the effect of the position of a fibre, whether near the surface or the axis of the yarn), and the effects of twist, of sizing, and of various other factors. The following factors which appear to be the cause of the deficiency of actual yarn-strength as compared with that calculated from the fibre-strength are discussed in the light of the knowledge available :—

(1) In testing yarns for strength the fibres are tested as groups ;
(2) In a yarn the fibres lie spirally ;
(3) The torsional forces arising from twist in a yarn may weaken the fibres under tension ;
(4) Towards their ends the fibres in a yarn do not bear a load equal to their strength ;
(5) Only part of a fibre is tested in the fibre-strength test ;
(6) Imperfect yarn structure resulting from (*i*) variation of count, (*ii*) imperfect mixing of the fibres, (*iii*) variation of twist, and (*iv*) imperfect "lie" of the fibres.
(7) Inequality of stress distribution between the axial and superficial fibres.

It is pointed out that these weakening factors are to some extent counterbalanced by a pseudo-strengthening factor due to the fibres being non-uniform, as a result of which the doubling together of the fibres may cause the weak places in some fibres to be supported by strong places in others.

Chemistry Laboratory.

From a consideration of the combined effects of all these factors the conclusion is drawn that the yarn-strength must depend in some manner on the fibre-strength ; and that while it is not at present possible to assign definite magnitudes to these various factors, it is yet easy to understand why only a small proportion of the strength of the fibres is apparently used in a yarn even when the breakage of the yarn is due at least as much to fibre-fracture as to fibre-slippage..

"*Research in Cotton Technology in India*, 1927."—This bulletin was prepared in accordance with the decision of the Technological Sub-Committee at its meeting in December 1927, and in the nature of the case is for the most part concerned only with the conclusions arrived at, the detailed evidence being given in the original bulletins. In some cases, however, short abstract tables were prepared specially for this summary bulletin in order to give point to the conclusions. The opportunity was taken to present the subject-matter in as wide an aspect as possible, and for this reason it was necessary in many instances to amplify the discussion given in the original bulletins. Thus the determination of the quality of cotton is discussed at some length in the Introduction ; the results obtained in the experiments on repeated blow-room treatment are discussed in connection with the importance of baling cotton only when it is in a clean condition, and it is pointed out that time has yet to show whether the desired cleanliness can best be obtained by clean picking in the first instance, or by the installation of pre-ginning cleaning machinery. A special section is devoted to the effects of temperature and humidity on the human factor in cotton spinning, and on the important matter of production. The conclusion is reached, so far as production is concerned, that the effect of the spinning conditions depends on the particular conditions existing in each mill—the operatives, the management, the machinery, and the cotton mixing and the counts spun from it—and would accordingly have to be determined for each mill separately. It is pointed out, too, that in any comparative production test it is most important to see that in each case the production is in the same "condition"—i.e., that it has the same percentage moisture content; if yarn is spun under dry and humid conditions successively without any change in either the cotton mixing or the machinery, and the yarn is weighed as spun, the extra moisture present in the more humid yarn must be allowed for—it must not be reckoned as a real increase in the production. It may be recorded that this last point appears to have been overlooked in some practical tests which have appeared to show that the installation of a humidifying plant leads to an increase in production. One other new point brought out in this summary bulletin is the value of duplicate tests ; an analysis is given of 263 sets of duplicate test results obtained in the testing of the standard cottons ; from this analysis it appears that the average difference between the strengths given by duplicates is about 5 per cent. ; this shows how important it is to make the spinning tests in duplicate. The other sections of this bulletin deal with (1) the standard Indian cottons, (2) spinning tests on small samples, (3) the seasonal variation of the standard Indian cottons, (4) the relation between fibre properties and spinning value.

"The Effect of Different Spindle Speeds on the Results of Spinning Tests."—As pointed out in the last Annual Report, various reasons made it desirable to increase the spinning speed in the tests carried out at the Laboratory. The difficulty then arose that a change in the spinning speed might render invalid a comparison of results obtained before and after the date of the change, unless it could be shown that the change in speed makes no difference to the results of the tests. The matter was therefore investigated by spinning eight of the more important standard Indian cottons of the 1926-27 season both at the old speeds and the new higher speeds. In view of the practical importance of the subject, the opportunity was taken in publishing the results to review briefly the whole subject of the effect of increasing the spinning speed, attention being drawn to the fact that this has to be considered in relation not only to the production but also to (1) the mill structure, (2) the spinning machinery, (3) the material being spun and (4) the human element. In these tests each cotton was spun in duplicate lots into three different counts of yarn, at low speeds and high speeds. The " low " spindle speed was 8,600 r.p.m. for all counts, the " high " spindle speeds were 8,900 r.p.m. for 20's, 9,550 r.p.m. for 30's, and 9,950 r.p.m. for 40's counts. A record was maintained of the number of yarn breakages in the ring frame in each case; each yarn was classified for evenness and neppiness, and subjected to tests for counts, lea strength, ballistic strength, single thread strength and extension, and twist. In all, 4,800 tests were made for lea strength and counts, 4,800 tests for ballistic strength and counts, 19,200 tests for single thread strength and extension, and 9,600 tests for twist.

The analysis of the results shows that, within the comparatively narrow limits of these tests, the higher spinning speed makes no difference whatever to the number of ring frame breakages, or to the strength, extension, evenness, and neppiness of the yarns. An examination of the minimum single-thread strength in relation to the calculated value for the maximum winding-on tension leads to the conclusion that breakages are to be attributed primarily to unevenness of the yarn, extending over an inch or two, rather than to neppiness or dirt in the yarn. It is concluded that, so long as the counts of yarn spun are well within the spinning capacity of the cotton, the results obtained at the high spinning speed are identical with those at the low spinning speed. Hence there is every justification for using the higher spindle speeds in the spinning tests on the standard Indian cottons. But if a cotton is being spun near its spinning limit, it is to be expected that an increase of spining speed will cause an increase in the number of spinning breakages both because of the greater unevenness of the finer count and also because of its greater weakness. Any factor contributing to unevenness of yarn should therefore be avoided. Excessive speed of machinery may lead to excessive vibration, and so to unevenness of yarn and more spinning breakages; thus there is a mechanical limit to the speed of the ring frame, although this limit will of course be higher for machinery in good condition. But if the counts of yarn being spun are well within the capacity of the cotton there is no disadvantage in spinning at the highest possible speed, for an increased production is then obtained without any sacrifice of the good qualities of the yarn.

"The Effect of Using Unbalanced Drafts instead of Balanced Drafts in the Spinning Preparation for Spinning Tests."—It is commonly believed that the drafts in the sequence of spinning preparation machines must be properly balanced, yet from the recommendations for drafts made by various authors it is clear that some flexibility in the co-ordination of drafts in the different machines must be regarded as permissible; the whole question really turns on where the limits are to be set. Now the procedure which has been adopted at the Technological Laboratory, in order to economize time and minimize the chances of mistakes being made, is so to arrange the drafts from the card onwards that the draft required in the ring frame for yarn of 30's counts is about 6, and to obtain other counts from the same rovings merely by changing the draft in the ring frame. In order to test the validity of this procedure of spinning three different counts (20's, 30's and 40's) from one set of rovings, experiments have been carried out in parallel series on eight standard Indian cottons displaying considerable differences between one another; ring frame drafts of 4.5, 6.6 and 8.6 were used for 20's, 30's and 40's counts respectively in the unbalanced draft series; and drafts of 5.3, 6.2 and 6.9 for 20's, 30's and 40's counts respectively in the balanced draft series.

Four lots of each cotton were prepared, two lots being spun into three different counts of yarn according to each scheme of drafts; suitable drafts were given in the various preparation machines in the two series. A record was maintained of the number of breakages in the ring frame, and each yarn was classified for evenness and neppiness, and subjected to tests for counts, lea strength, single thread strength and extension, and twist. In all, 5,400 tests were made for lea strength and counts, 10,800 tests for single-thread strength and extension, and 10,800 tests for twist.

An analysis of the results shows that the difference in the system of drafting makes no practical difference to the number of breakages in the ring frame, or to the evenness, neppiness, strength, and extension of the yarn. For one of the cottons—C.A.9—results were at first obtained which appeared to indicate that the unbalanced draft system yielded stronger yarn than the balanced draft system at higher and low counts, and yarn of equal strength in the 30's counts, for which the drafts were the same on the two systems. A repetition of the tests on this cotton indicated that the differences in question were not due to some specific character of the cotton, but that they must be attributed to sampling errors in the selection of the cotton for the spinning tests.

It is concluded from these tests that a comparatively wide variation is possible in the series of drafts used in the spinning tests without affecting the results to any appreciable extent, and that the usual procedure at the Technological Laboratory of spinning the three different counts from one set of rovings is therefore completely justified.

An appendix deals with the principles of roller drafting in relation to the arrangement of the fibres of the material drafted: a rule of drafting is formulated—that if x is the draft to which any group of fibres is subjected, then the distance between the front ends of any two fibres after drafting is x times the distance before drafting. By the application of this rule it is shown that irregularity may be due not only to general irregularity arising from differences in the scutcher laps but also to the effect of drafting. It is pointed out that the fluting of the bottom drafting rollers, the clinging power of the cotton, and the irregularities of length and thickness of the fibre are also factors which affect the drafting. The operation of all the factors is then examined in their relation to the particular problem of balanced and unbalanced drafts, and it is finally concluded that there is no adequate reason to expect appreciably different results from the two systems.

"*Technological Reports on Standard Indian Cottons,* 1928."—The various changes made in this edition of "Technological Reports" have already been mentioned. The general results which are discussed at some length in the prefatory note to the reports are as follows:—

(*i*) *The characteristics of the various standard Indian Cottons.*—The cottons are divided into four classes:—

Class I, suitable for 30*'s and over:*
Bombay.—Dharwar 1, Gadag 1, Surat 1027 A.L.F.
Punjab.—Punjab-Americans, 285F and 289F.
United Provinces.—Cawnpore-American C.A.9.
Madras.—Coimbatore Co. 1 (Cambodia 295), Nandyal 14.

Class II, suitable for counts between 20*'s and* 30*'s:*
Punjab.—Punjab-American 4F.
Madras.—Hagari 25, Karunganni C7.
Hyderabad.—Umri Bani.

Class III, suitable for counts between 10*'s and* 20*'s:*
Bombay.—Wagad 4, Wagad 8.
United Provinces.—Cawnpore K. 22, Bundelkhand J.N.1.

Class IV, suitable only for counts below 10*'s:*
Punjab.—Mollisoni.
United Provinces.—Aligarh A. 19.

Attention is drawn to the fact that the hand-stapling method of the Grader appears to exaggerate the differences between the staple lengths of fine and coarse cottons, and reasons are advanced to explain the discrepancies between his estimates and the Sorter determinations.

(*ii*) *The seasonal variation of the standard Indian cottons.*—Tables are given showing the seasonal variation of each cotton in mean fibre-length. and in highest suitable counts over five seasons; three cottons (285F, Co. 1 and Hagari 25) show a maximum seasonal variation between 15 and 25 per

cent. in fibre-length, and five cottons (Gadag 1, Wagad 4, 289F, Mollisoni and Co. 1) show a maximum seasonal variation of more than 20 per cent. in highest suitable counts. There is no evidence to show that any of the cottons has undergone any deterioration of type.

(*iii*) *The relation between fibre characters and spinning value.*—The relation is discussed for each fibre-property in turn, and it is shown that when the cottons are arranged in the order of highest suitable counts, there is discernible for all properties except fibre-strength a fairly well-marked general trend more or less parallel to that of the counts: no such general trend is discernible for the ratio of fibre-strength to fibre-weight per inch. As to the ratio of fibre-rigidity to the square of the fibre-weight per inch, there seems to be a fundamental specific distinction between *hirsutum* and *herbaceum* cottons in this character, for the 14 values for *hirsutum* cottons cluster round 0.5, and the 10 values for *herbaceum* cottons round 0.3. There are so many individual exceptions to each general trend that it is concluded that no single fibre-property can serve as a universal criterion to indicate the highest suitable counts into which a cotton can be spun.

(*iv*) *The results for the* 1927-28 *cottons.*—Taken as a whole, the standard cottons of the 1927-28 season give much the same spinning test results as in previous seasons. Some differences have been observed, however, in the fibre-properties of the cottons; the most outstanding of these differences are the much increased fibre-weights of all the Punjab cottons, and the much reduced fibre-weights of both the Wagad cottons in 1927-28 as compared with 1926-27. These changes are accompanied by similar changes of greater or less degree in the fibre-strengths and fibre-rigidities. It is believed that all these changes are associated with a diminished water-supply in the Punjab* and the occurrence of floods in the Dholleras tract in 1927-28. It is remarkable that such great changes have been almost without effect on the spinning capacities of the various cottons.

IV. GENERAL.

(1) A visit to the Technological Laboratory was included in the programme of His Excellency the Viceroy, Lord Irwin, on the occasion of his visit to Bombay, but owing to the deeply regretted illness which struck down His Excellency the day after his arrival in Bombay, he was unable to carry out the later part of the programme, including the visit to the Laboratory.

(2) *Staff.*—The staff of the Laboratory on August 31st, 1928, was as follows:—

Director:—A. James Turner, M.A., B.Sc.

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* Later information points to the conclusion that the fibre-weights obtained for the Punjab cottons in 1926-27 were really the abnormal ones, and that these were probably due to an unsatisfactory water-supply in that season.

Research Laboratory.

Physics Section :—

Junior Research Assistants :—Hari Rao Navkal, M.Sc. ; Ram Saran Koshal, M.Sc.

Junior Testing Assistants :—S. S. Sukthankar, L.T.C. ; K. G. Deo ; H. B. B. Joshi, B.Sc. ; K. S. Marar, B.A. ; H. R. Nayak. ; R. G. Panvalkar, B.Sc.

Chemistry Section :—

Senior Research Assistant :—D. L. Sen, M.Sc.Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistants :—H. N. Dutt, B.Sc., M.B. ; Amar Nath Gulati, M.Sc.

Instrument Maker :—Moreshwar M. Patke.

Spinning Laboratory.

Spinning Master :—R. P. Richardson, A.T.I.

Assistant Technologist :—D. F. Kapadia, B.Sc.Tech., B.A.

Yarn Testing Section :—

Statistician :—V. Venkataraman, M.A.

Junior Testing Assistants :—G. D. Bhide, B.Sc. ; K. V. N. Nayar ; V. N. Modak, B.Sc. ; L. V. Sundararaman, B.A. ; P. S. Sambamurthi ; G. J. Kharkar, B.Sc.

Statistical Clerks :—R. Krishna Iyer ; P. K. Wagle.

Spinning Assistant :—N. Iyengar.

Electrician :—Herculano Lobo, L.E.E.

Clerk :—D. C. Mullan.

Director's Office :—

Head Clerk :—M. T. Majmudar.

Stenographer :—B. P. Jain.

Clerk :—M. T. Sundaram.

Draughtsman :—B. G. Mehta.

Mr. D. F. Kapadia, who was appointed Assistant Technologist at the fifteenth meeting of the Committee took up the appointment on January 1st, 1928.

During the year the following members of the staff resigned their appointments :—

Mr. N. A. Gadre—Head Clerk.
Mr. K. S. Venkatram—Electrician.

The vacant posts were duly filled by :—

Mr. M. T. Majmudar—Head Clerk.
Mr. Herculano Lobo—Electrician.

Microscopy Laboratory.

In order to cope with the steadily accumulating mass of statistics to which frequent reference has been made in the present report, the creation of two new posts of "Statistical Clerk" was sanctioned at the fifteenth meeting of the Committee; these posts have been filled by Messrs. R. Krishna Iyer and P. K. Wagle, who took up their duties on April 16th, 1928.

(3) *Research Students.*—Messrs. K. R. Sen and S. E. Kumana, having completed their work on a series of special cottons of different botanical species, assisted in the work of the Fibre Testing Section, in order to gain experience of the different methods of fibre-testing. They were later appointed to posts instituted by the Committee with a view to utilizing their trained services in the Provinces, Mr. Sen being appointed to Coimbatore (Madras) and Mr. Kumana to Dharwar (Bombay).

Mr. R. L. N. Iyengar, who joined the Laboratory on April 1st, 1927, was first trained in methods of fibre-testing; he was then set to determine the fibre-lengths and fibre-weights of the standard cottons of the 1926-27 season. In these tests Mr. Iyengar used the *kapas*, and from the ginning percentage, which he has also determined from the particular samples, it is now possible to calculate the average number of fibres of each group-length per seed for each of the cottons. He is repeating the whole of this work on the standard cottons of 1927-28. Already his results have proved most interesting, and there is no doubt that when those of the second season are available, they will be doubly so.

Mr. C. Nanjundayya joined the Laboratory as a Research Student on March 15th, 1928, and after acquiring experience in the fibre-testing section, has been engaged in the determinations of the fibre-weight per inch of the different botanical species which have been subjected to many other fibre-tests by other research students.

(4) *Buildings and Equipment.*—There have been no additions or alterations to the buildings or major equipment during the year; the more important minor equipment which has been added comprises a Gallenkamp torsion balance, three reading telescopes, a cathetometer, a Balls magazine hair tester, three platinum crucibles, an Avery platform weighing machine, a Goodbrand lea tester, and a Goodbrand wrap reel. A good deal of apparatus has been made in the Laboratory workshop; this includes apparatus for the determination of fibre-strength (by two different methods), fibre-rigidity, and fibre-weight. Apparatus for the determination of fibre-properties has also been made for the new fibre-testing laboratories at Coimbatore and Dharwar. The services of the Instrument Maker have in fact been constantly employed throughout the year, either in making new apparatus, or in repairing the numerous small defects in the testing and spinning equipment which inevitably arise through continuous usage; a similar service has been performed for the meteorological instruments supplied to a number of the cotton-growing stations.

No account of the work of the Laboratory would be complete without an acknowledgment of the valued assistance received from several members of the East India Cotton Association who have undertaken the grading of the various samples of cottons submitted to the Laboratory for spinning trials. The Grader's report has formed an integral part of the reports on new cottons.

In conclusion, I am pleased to be able to say that the work of the staff has continued to be of a high standard, and to record my thanks to them for the willing manner in which they have accorded me their support by devoting themselves to their work, much of which in the nature of the case is, to the individual tester, routine work in which great accuracy is nevertheless required, and which is perforce rather uninspiring in itself whatever may be done to relieve its tedium.

A. JAMES TURNER,

Director, Technological Laboratory.

24th September 1928.

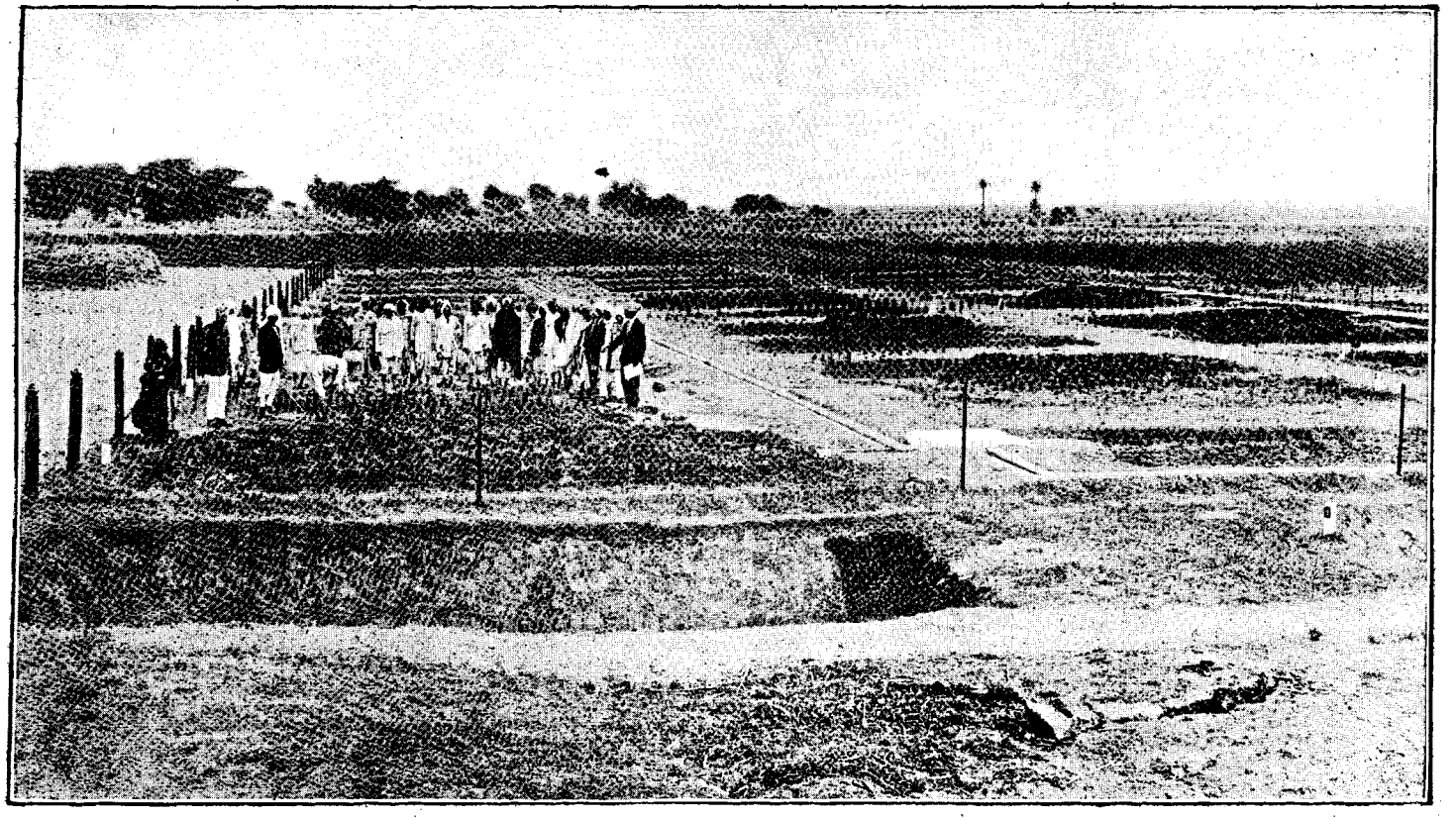
TABLE 1.—SUMMARY OF FIBRE PROPERTIES OF STANDARD INDIAN COTTONS, 1926-27 and 1927-28.

A.—ENGLISH UNITS.

Sample No.	Cotton.	Season.	Fibre-Length (inch.)		Fibre-Strength (oz.)		Fibre-Weight per inch. (10-7 oz.)	Ribbon Width. 10-3 inch.	Convolutions per inch.	Fibre-Rigidity (oz.-in.2 × 10-7)	Highest Standard Warp Counts.
			Balls.	Baer.	Balls.	O'Neill.					
245	Dharwar 1	1926-27	0.88	0.90	0.183	0.162	2.04	0.61	67	1.09	34
373	,, ...	1927-28	0.89	0.89	0.145	0.148	2.01	0.65	76	1.32	32
244	Gadag 1	1926-27	0.80	0.82	0.144	0.140	1.77	0.63	110	1.51	28
368	,, ...	1927-28	0.86	0.86	0.144	0.152	1.68	0.62	115	1.52	38
246	Surat 1027 A. L. F.	1926-27	0.97	0.98	0.168	0.169	2.01	0.73	96	1.62	32
363	,, ,, ..	1927-28	0.95	0.94	0.152	0.166	2.03	0.74	73	1.32	30
272	Wagad 4	1926-27	0.86	0.84	0.189	0.179	2.54	0.68	46	1.89	16
371	,, ...	1927-28	0.79	0.80	0.110	0.098	1.82	0.70	47	1.01	18
271	Wagad 8	1926 27	0.80	0.81	0.186	0.180	2.60	0.72	45	2.21	14
372	,, ...	1927-28	0.77	0.77	0.135	0.106	1.87	0.72	46	1.22	14/16
232	P. A. 4 F.	1926-27	0.79	0.77	0.137	0.131	1.34	0.70	104	0.93	24
340	,, ...	1927-28	0.79	0.79	0.138	0.152	1.82	0.70	102	2.10	22
233	P. A. 285 F.	1926-27	0.83	0.82	0.103	0.131	1.04	0.64	100	0.59	34
367	,, ...	1927-28	0.88	0.90	0.133	0.126	1.33	0.59	110	1.04	34
234	P. A. 289 F.	1926-27	0.96	0.98	0.121	0.101	0.98	0.62	88	0.53	38
341	,, ...	1927-28	0.93	0.95	0.111	0.136	1.40	0.62	118	0.92	40
230	Mollisoni	1926-27	0.68	0.69	0.171	0.166	2.69	0.77	65	2.42	8
325	,, ...	1927-28	0.73	0.73	0.186	0.169	3.26	0.88	114	4.63	8
227	Aligarh A. 19	1926-27	0.66	0.66	0.192	0.193	3.00	0.79	80	3.61	6/8
352	,, ...	1927-28	0.70	0.70	0.186	0.196	2.96	0.82	72	4.50	6/8
228	Cawnpore K. 22	1926-27	0.73	0.73	0.185	0.180	2.37	0.71	72	2.80	12
351	,, ,, ...	1927-28	0.74	0.76	0.158	0.165	2.40	0.78	70	3.76	12
229	Bundelkhand J. N. 1	1926-27	0.78	0.77	0.187	0.187	2.42	0.71	65	2.16	14
350	,, ,, ...	1927-28	0.75	0.73	0.178	0.190	2.22	0.71	74	2.45	14
231	Cawnpore G. A. 9	1926-27	0.87	0.88	0.171	0.157	1.82	0.61	119	1.85	34
349	,, ,, ...	1927-28	0.87	0.86	0.133	0.148	1.74	0.63	105	1.70	30
265	Coimbatore Co. 1	1926-27	0.93	0.92	0.140	0.120	1.56	0.59	91	1.24	38
374	,, ,, ...	1927-28	0.92	0.95	0.136	0.140	1.64	0.60	110	1.34	34
273	Nandyal 14	1926-27	0.94	0.93	0.257	0.200	1.90	0.61	46	1.42	34
378	,, ...	1927-28	0.89	0.87	0.225	0.232	1.93	0.67	56	1.47	30
269	Hagari 25	1926-27	0.77	0.75	0.114	0.111	1.76	0.65	54	0.97	26
377	,, ...	1927-28	0.86	0.89	0.150	0.122	2.06	0.70	76	1.12	26
270	Karunganni C	1926-27	0.85	0.85	0.196	0.180	1.92	0.65	57	1.70	24
383	,, ...	1927-28	0.85	0.85	0.174	0.156	1.80	0.62	62	1.56	24
203	Umri Bani	1926-27	0.81	0.82	0.190	0.184	1.99	0.67	65	1.60	24
333	,, ...	1927-28	0.82	0.81	0.150	0.175	1.89	0.63	93	1.88	24
200	Memphis	1925-26	0.96	0.95	0.153	0.159	1.78	0.62	110	1.46	40
206	Texas	1925-26	0.85	0.88	0.174	0.158	2.04	0.58	140	2.10	30

TABLE 2.—SUMMARY OF TEST RESULTS ON STANDARD INDIAN COTTONS, 1923-28.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
					Waste Percentages.				Ring Frame Particulars.					Yarn Test Results.											Temperature (°F).	Relative Humidity (%).		
														Lea.				Single Thread.									
Sample No.	Cotton.	Season.	Counts Nominal.	Mean Fibre Length Bailey Sorter (Inch).	Blow Room Loss.	Card Room Loss.	Spinning Loss.	Total Loss.	Yarn Breakages per 100 spindles per hour.	Front Roller R. P.M.	Front Roller Diameter (inch).	Draft.	Turns per Inch.	Counts Actual.	Strength (lbs.)	Strength Irregularity (%).	Count-Strength Product.	Strength (ozs.)	Strength Irregularity (%).	Weakness Percentage.	Extension (%).	Extension Irregularity (%).	Turns per Inch Actual.	Spinning Room.	Spinning Room.	Testing Room.	Highest Standard Warp Counts
62	Dharwar I ..	1923-24	20	0.88	6.5	7.2	0.8	13.8	0	184	7/8	4.49	16.85	19.8	97.5	4.8	1,921	10.8	9.6	2.4	4.3	16.6	19.3	86	80	80	34
72	,, ..	1924-25	20	0.88	6.7	6.8	0.9	22.3	33	183	7/8	4.49	16.85	19.1	100.2	4.7	1,914	13.7	7.1	0	4.5	10.1	15.5	83	79	81	34
128	,, ..	1925-26	20	0.88	12.2	7.1	0.5	18.8	8	182	7/8	4.50	16.85	19.6	99.6	4.9	1,776	11.8	8.0	0.5	6.2	10.8	17.0	90	69	81	34
245	,, ..	1926-27	20	0.88	12.6	7.5	0.3	19.4	3	190	7/8	4.36	16.85	19.0	98.7	5.0	1,875	13.3	10.3	1.8	7.2	7.6	16.2	91	68	79	34
329	,, ..	1927-28	20	0.89	13.1	8.0	0.1	20.1	3	191	7/8	4.34	16.85	20.1	88.8	5.7	1,785	12.3	12.2	4.5	6.6	8.6	16.2	88	65	69	32
70	Gadag I	1923-24	20	0.90	5.0	7.0	0.8	12.3	13	183	7/8	4.60	16.85	19.8	86.0	6.7	1,703	10.2	9.7	2.8	3.6	14.4	18.9	84	77	55	36
71	,, ..	1924-25	20	0.82	8.4	8.9	1.3	17.8	35	183	7/8	4.36	16.85	19.6	99.7	6.4	1,170	9.4	7.4	0.2	4.9	9.6	15.9	83	76	64	20
131	,, ..	1925-26	20	0.83	8.8	8.6	0.6	17.0	19	180	7/8	4.76	16.85	19.6	75.7	6.3	1,484	10.7	12.8	4.3	6.1	11.7	18.4	91	67	65	30
244	,, ..	1926-27	20	0.83	9.6	7.5	0.3	19.8	3	190	7/8	4.44	16.85	19.5	99.4	4.0	1,938	13.5	11.1	3.3	7.9	7.7	16.1	91	68	82	38
368	,, ..	1927-28	20	0.86	5.5	7.9	0.1	13.1	3	190	7/8	4.67	16.85	19.8	94.2	5.3	1,865	13.0	9.6	1.8	7.3	8.2	16.3	88	65	67	38
104	Surat 1027 A.L.F.	1923-24	20	1.00	6.4	8.0	0.6	14.3	10	182	7/8	4.13	16.85	19.9	75.2	6.1	1,496	10.6	9.0	0	5.8	9.2	17.6	86	68	49	30
83	,, ..	1924-25	20	0.95	5.2	7.6	0.4	12.8	0	181	7/8	4.00	16.85	19.3	99.0	4.1	1,885	10.9	9.6	1.0	5.0	11.6	20.6	86	70	64	32
116	,, ..	1925-26	20	0.92	5.9	7.3	0.7	12.7	15	182	7/8	4.13	16.85	19.9	72.9	9.0	1,451	11.0	11.9	4.3	5.7	9.6	16.5	86	65	65	26
246	,, ..	1926-27	20	0.97	6.2	7.3	0.5	13.3	10	192	7/8	4.46	16.85	19.6	88.2	4.8	1,729	12.3	8.5	0.3	6.7	16.3	23.9	94	65	82	32
369	,, ..	1927-28	20	0.96	3.6	7.7	0.3	11.3	0	190	7/8	5.01	16.85	20.0	79.1	7.0	1,582	10.6	9.8	2.3	6.0	7.9	16.5	85	58	65	30
161	Wagad 4 ..	1925-26	14	0.82	9.0	12.7	0.5	20.8	4	188	7/8	7.3	15.97	13.9	92.1	5.0	1,280	13.1	10.7	2.5	6.1	9.4	15.8	85	81	78	14
272	,, ..	1926-27	14	0.86	7.8	8.5	0.5	16.1	17	192	7/8	7.28	15.03	14.4	94.6	5.6	1,362	13.4	11.0	0.8	8.1	6.7	14.8	85	74	71	16
371	,, ..	1927-28	14	0.79	9.7	9.2	0.3	18.2	4	192	7/8	7.51	15.08	14.6	99.7	4.3	1,454	13.8	8.2	0	8.5	6.0	14.5	86	62	69	18
160	Wagad 8 ..	1925-26	14	0.80	8.3	12.9	0.4	20.3	14	174	7/8	6.85	15.97	13.8	84.7	7.6	1,169	12.6	9.9	1.5	6.3	9.8	14.7	87	81	83	12
271	,, ..	1926-27	14	0.80	7.4	8.4	0.3	15.5	4	190	7/8	6.99	15.08	14.0	88.5	3.9	1,239	11.9	12.9	5.5	5.9	7.3	14.9	87	72	74	14
372	,, ..	1927-28	14	0.77	9.1	9.8	0.1	18.0	0	192	7/8	5.59	15.08	14.6	88.8	4.7	1,296	11.9	10.0	2.8	8.5	9.1	14.8	88	63	70	14/16
81	P. A. 4F	1924-25	20	0.81	6.0	7.3	1.3	15.8	29	180	7/8	5.27	16.85	19.3	85.1	6.8	1,256	8.8	13.7	7.0	4.8	17.5	18.0	73	75	62	22
121	,, ..	1925-26	20	0.91	6.7	6.5	0.4	13.7	3	180	7/8	5.32	16.85	19.8	75.2	4.6	1,489	10.2	10.8	3.5	5.9	6.7	16.4	88	63	59	22
232	,, ..	1926-27	20	0.79	9.6	9.5	0.4	18.4	10	191	7/8	5.32	16.85	19.8	75.2	4.6	1,489	10.2	10.8	3.5	9.9	6.7	16.4	88	63	78	24
340	,, ..	1927-28	20	0.79	6.5	7.9	0.4	14.1	38	187	7/8	5.21	16.85	19.4	68.6	6.5	1,252	9.8	13.5	6.5	7.5	10.0	16.4	81	69	65	22
106	P. A. 285F ..	1923-24	20	1.04	10.4	10.3	0.8	20.1	0	182	7/8	4.13	16.85	19.3	100.1	4.8	1,932	12.6	9.9	2.0	6.6	9.2	18.0	84	69	57	34
85A	,, ..	1924-25	20	0.92	4.7	9.9	0.6	14.8	15	181	7/8	4.26	16.85	19.0	97.1	6.7	1,845	11.5	9.4	1.3	4.8	16.2	17.3	85	66	55	34
113	,, ..	1925-26	20	0.94	10.9	11.2	0.3	21.1	10	182	7/8	4.17	16.85	19.3	82.9	4.9	1,598	11.5	9.9	1.8	6.1	10.2	16.2	86	68	62	28
239	,, ..	1926-27	20	0.85	12.3	11.2	0.3	23.4	3	190	7/8	4.52	16.85	19.0	98.5	3.9	1,739	11.9	12.9	5.5	7.0	7.3	14.9	90	66	72	34
367	,, ..	1927-28	20	0.88	8.5	12.5	0.3	20.1	5	191	7/8	4.56	16.85	19.9	85.4	4.2	1,699	12.5	10.3	2.0	6.9	7.2	16.4	89	64	69	34
80	P. A. 289F ..	1924-25	20	1.01	8.9	8.6	0.8	17.3	29	181	7/8	4.82	16.85	20.4	88.6	8.6	1,207	11.8	8.2	2.3	6.6	8.4	21.8	74	72	81	36
120	,, ..	1925-26	20	1.00	8.4	9.4	0.6	17.4	23	183	7/8	4.65	16.85	20.2	84.3	9.8	1,203	13.0	9.6	3.5	5.8	8.8	17.5	91	62	64	30
234	,, ..	1926-27	20	0.96	12.8	12.2	0.4	23.7	5	191	7/8	4.58	16.85	19.3	107.5	7.4	2,078	14.8	9.6	1.3	7.7	8.4	16.5	90	65	80	38
341	,, ..	1927-28	20	0.93	8.6	10.6	0.2	18.3	0	191	7/8	4.51	16.85	19.6	104.2	5.8	2,042	14.2	10.1	1.5	8.5	16.3	88	68	66	40
122	Molhsoni ..	1925-26	8	0.72	5.1	7.8	1.2	13.4	0	174	7/8	5.07	12.07	8.0	76.6	10.8	613	13.1	18.2	14.8	7.5	12.7	12.6	85	61	63	6
230	,, ..	1926-27	8	0.68	7.1	8.3	0.3	15.8	15	185	7/8	4.83	12.07	7.7	111.4	6.6	858	15.6	18.6	11.5	12.6	9.4	11.9	89	64	81	8
324	,, ..	1927-28	8	0.73	4.0	6.8	0.4	10.8	20	200	7/8	5.33	12.07	7.9	101.8	8.5	804	13.5	16.4	11.5	9.0	8.6	11.9	88	66	69	8
22	Aligarh A. 19 ..	1924-25	8	0.71	4.1	7.0	1.2	11.9	20	221	7/8	4.86	12.07	7.8	82.1	15.7	640	17.7	16.1	9.4	5.3	19.6	13.1	90	65	78	6/8
111	,, ..	1925-26	8	0.72	5.9	8.0	1.4	13.8	35	200	7/8	5.09	12.07	7.9	108.8	8.0	859	17.0	15.2	10.0	7.2	11.8	12.9	87	64	66	8
227	,, ..	1926-27	8	0.69	5.9	8.0	0.4	14.3	35	198	7/8	4.72	12.07	7.9	75.3	7.8	894	15.7	13.6	4.5	8.9	9.4	11.9	87	69	55	6/8
352	,, ..	1927-28	8	0.70	3.1	7.9	0.5	11.5	10	189	7/8	5.19	12.07	7.9	94.9	8.4	895	15.1	16.9	11.0	7.4	10.0	11.8	91	65	54	6/8
79	Cawapore K. 22	1924-25	20	0.86	8.4	7.4	0.5	15.8	35	211	7/8	5.27	12.63	9.6	117.3	8.6	1,126	19.7	13.3	5.0	7.4	10.7	13.9	76	75	54	12
129	,, ..	1925-26	20	0.82	6.3	7.4	0.3	14.0	28	198	7/8	5.38	12.63	9.6	107.2	4.3	1,951	15.5	14.4	7.5	8.7	7.6	12.4	88	67	66	12
228	,, ..	1926-27	20	0.73	4.0	6.9	0.4	10.9	3	198	7/8	5.38	12.63	9.8	107.2	4.3	1,951	15.5	14.4	7.5	8.7	7.6	12.4	88	68	62	12
351	,, ..	1927-28	20	0.74	6.4	7.3	0.5	13.6	10	196	7/8	4.71	12.63	10.1	99.0	6.9	1,909	14.6	12.7	5.3	7.8	8.7	12.4	81	68	68	12
78	Bundelkhand J.N.I	1924-25	20	0.78	5.7	6.4	1.0	12.6	75	192	7/8	5.86	13.58	10.4	115.8	9.8	1,204	18.8	10.8	3.0	10.7	13.4	13.7	86	77	61	12
113	,, ..	1925-26	20	0.77	5.7	7.9	0.8	13.7	5	176	7/8	5.88	13.58	9.8	127.3	6.4	1,248	20.0	13.5	6.3	7.8	11.3	13.9	85	68	64	12
229	,, ..	1926-27	20	0.78	7.2	7.3	0.4	14.2	5	206	7/8	4.88	12.63	9.9	118.5	6.8	1,173	17.9	14.1	5.5	9.2	8.7	12.4	90	66	44	14
350	,, ..	1927-28	20	0.75	6.9	8.8	0.4	15.3	0	198	7/8	4.89	12.63	10.5	108.5	5.9	1,150	17.8	11.4	6.3	6.9	8.8	12.4	80	66	44	14
77	Cawapore C. A. 9	1924-25	20	0.89	6.8	7.3	0.9	14.3	10	184	7/8	4.49	16.85	19.2	84.4	7.9	1,620	12.0	9.3	1.8	4.8	15.9	21.0	82	76	56	28
112	,, ..	1925-26	20	0.87	6.6	9.5	0.8	15.8	18	182	7/8	4.49	16.85	19.0	83.6	6.1	1,588	11.9	10.4	2.8	5.5	7.4	16.3	89	64	67	28
231	,, ..	1926-27	20	0.87	7.9	7.9	0.4	16.2	10	195	7/8	4.35	16.85	19.2	81.8	4.8	1,572	12.8	14.7	7.5	7.3	7.4	16.3	82	63	73	34
349	,, ..	1927-28	20	0.87	6.8	8.7	0.4	15.7	8	193	7/8	4.28	16.85	19.9	76.7	5.7	1,528	10.4	16.2	8.8	5.5	10.6	16.3	82	67	69	30
105	Coimbatore Co. 1	1923-24	20	1.04	4.5	6.4	0.5	11.0	15	181	7/3	4.22	16.85	19.7	84.7	6.2	1,669	10.5	11.4	3.3	4.3	18.2	17.0	86	72	51	32
84	(Cambodia 295)	1924-25	20	0.86	4.5	7.5	0.5	12.0	8	180	7/8	4.22	16.85	19.8	82.7	3.9	1,637	12.0	6.9	0.1	6.7	6.3	18.4	87	74	58	30
126	,, ..	1925-26	20	0.90	4.8	6.1	0.4	10.9	3	182	7/8	4.49	16.85	19.7	88.3	4.9	1,740	11.3	7.7	0.8	6.0	6.8	17.6	87	74	78	38
265	,, ..	1926-27	20	0.93	4.0	8.7	0.2	12.6	3	192	7/8	4.78	16.85	19.8	103.7	4.0	2,053	13.6	8.6	0.8	8.8	8.3	16.3	87	62	70	34
374	,, ..	1927-28	20	0.92	3.5	7.9	0.1	11.3	0	195	7/8	4.55	16.85	20.2	89.6	5.0	1,810	12.1	8.6	1.0	6.5	8.3	16.3	87			
72	Nandyal 14 ..	1923-24	20	0.90	6.0	6.6	0.9	13.6	10	182	7/8	4.35	16.85	19.4	93.5	6.0	1,814	13.8	11.3	3.2	5.9	9.6	19.3	84	73	57	34
74	,, ..	1924-25	20	0.88	8.2	8.1	0.6	16.7	23	179	7/8	4.44	16.85	19.2	98.9	7.4	1,784	10.8	11.7	3.8	3.4	19.1	17.3	83	80	52	32
162	,, ..	1925-26	20	0.89	6.9	7.1	0.5	14.5	23	179	7/8	4.27	16.85	19.3	79.8	4.8	1,536	11.8	7.8	1.5	5.9	6.5	15.9	87	79	64	30
273	,, ..	1926-27	20	0.94	8.5	8.7	0.6	16.9	30	189	7/8	4.55	16.85	19.9	88.7	6.5	1,765	12.5	10.3	1.8	6.8	6.4	16.4	90	67	69	30
378	,, ..	1927-28	20	0.89	7.3	8.8	0.4	15.7	10	192	7/8	4.52	16.85	19.7	81.9	9.7	1,613	11.0	12.8	6.0	6.4	8.0	16.3	90			
75	Hagari 25 ..	1923-24	20	0.90	10.2	7.3	1.0	17.6	8	183	7/8	4.35	16.85	19.2	75.0	10.5	1,440	11.8	9.4	0.3	4.8	11.0	17.7	86	72	63	28
76	,, ..	1924-25	20	0.86	5.4	7.1	0.4	12.4	13	183	7/8	4.44	16.85	19.5	97.4	8.0	1,704	11.1	8.1	1.0	4.6	12.8	17.4	87	73	61	28
163	,, ..	1925-26	20	0.85	5.5	8.8	0.4	14.7	20	183	7/8	4.44	16.85	19.8	75.7	5.4	1,516	10.6	13.2	3.3	6.7	8.9	16.3	85	67	69	26
269	,, ..	1926-27	20	0.77	5.3	8.9	0.3	13.8	14	192	7/8	4.44	16.85	19.4	78.9	6.5	1,516	10.6	13.2	3.3	6.7	8.9	16.4	89	67	69	26
377	,, ..	1927-28	20	0.86	5.9	8.3	0.3	13.9	15	190	7/8	4.55	16.85	19.4	78.9	5.0	1,531	10.7	12.8	6.5	6.8	9.0	16.4	89			
86	Karungaani C ..	1924-25	20	0.85	5.9	8.4	1.1	14.6	18	182	7/8	4.04	16.85	19.6	79.5	7.1	1,558	9.8	11.0	3.0	5.3	8.4	16.9	87	71	66	26
175	,, ..	1925-26	20	0.83	4.2	7.9	0.3	11.9	8	184	7/8	4.31	16.85	20.2	70.2	9.4	1,418	10.7	13.4	4.8	5.5	10.6	15.7	87	68	68	26
270	,, ..	1926-27	20	0.85	2.9	8.9	0.6	11.2	30	193	7/8	4.35	16.85	20.1	68.7	6.9	1,391	9.6	14.2	5.8	6.2	8.1	16.3	87	73	73	24
383	,, ..	1927-28	20	0.85	5.3	8.5	0.2	13.8	32	190	7/8	4.37	16.85	19.8	70.8	6.6	1,396	10.0	14.7	7.1	5.8	8.1	16.3	91	64	69	24
82	Umri Bani ..	1924-25	20	0.85	15.8	10.3	1.1	25.2	30	182	7/8	5.20	16.85	19.7	80.7	8.7	1,196	9.4	13.5	8.5	5.2	11.0	19.7	73	72	55	22
114	,, ..	1925-26	20	0.83	13.0	8.7	0.5	20.9	8	181	7/8	5.13	16.85	19.3	70.6	10.0	1,363	10.7	13.9	3.3	5.9	16.8	83	68	64	51	24
233	,, ..	1926-27	20	0.81	11.6	7.7	0.3	18.5	16	192	7/8	5.16	16.85	20.5	64.4	7.4	1,320	10.0	13.3	6.8	5.9	8.4	16.4	82	68	68	24
333	,, ..	1927-28	20	0.82	11.7	9.1	0.4	19.9	10	186	7/8	5.19	16.85	20.2	65.9	6.4	1,331	9.8	15.3	9.8	6.8	8.4	16.4				
55	Mississippi ..	1923-24	20	1.01	4.4	7.4	0.5	11.8	18	157	1	4.35	16.85	19.5	95.3	5.4	1,858	10.2	11.7	3.6	5.7	16.9	17.9	88	87	66	40
390	Memphis ..	2023-24	20	0.96	5.6	8.1	0.4	14.5	5	159	1	4.55	16.85	19.7	103.8	4.2	2,045	12.9	8.1	0	8.2	7.9	17.1	91	64	54	38
58	Texas	1923-24	20	0.85	5.4	9.0	1.3	15.0	33	180	7/8	5.22	16.85	19.8	81.5	8.0	1,218	8.6	14.6	7.8	4.0	13.5	16.8	88	80	67	36
396	,, ..	2023-24	20	0.85	5.3	6.7	0.3	11.8	5	182	7/8	4.50	16.85	20.2	84.3	4.1	1,703	12.0	9.8	0.8	7.8	6.7	17.0	90	67	66	39



The Manufacture of Chinese Compost.

APPENDIX I.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the year ended 30th June 1928.

I. Introduction.

This report covers the third agricultural year of the Institute of Plant Industry. Since the beginning of April 1925, when actual work on the land commenced, the Institute has been brought into working order and a number of definite improvements in the production of raw cotton and of related crops have been worked out which have been brought to the notice of the cultivators of Central India and Rajputana. The number of visitors is steadily increasing and there is a growing demand for all kinds of assistance.

With the development of local interest there has been an increase in financial support. When the Institute started, eight of the Central India States—Indore, Datia, Dhar, Dewas (S. B.), Ratlam, Jaora, Sitamau and Narsinghgarh—contributed a total annual sum of Rs. 20,800. Two additional States of Central India—Bijawar and Barwani—and three of the States of Rajputana—Bikaner, Tonk and Jhalawar—have joined the scheme during the year. This has resulted in an addition to the annual income of the Institute of no less than Rs. 9,750. Besides the increase in the number of the Contributing States from eight to thirteen, five donations amounting to Rs. 9,808 have been received during the year. A large portion of this—Rs. 8,458—has been contributed by the Holkar State for the erection of a hostel for officers of the State who visit the Institute. The cost of furnishing this hostel amounts to Rs. 750 which is also being borne by the Holkar State. A total sum of Rs. 500 has been contributed to the new lending library since January 1928 by the following: Raja Gobind Singh of Jaipur, Khan Bahadur B. K. Illava and Mr. R. S. Patel. Raja Gobind Singh has also given Rs. 100 for vernacular publications. This will be used for preparing summaries in Hindi for the next cultivators' meeting.

The fourth meeting of the Board of Governors took place in the Library of the Institute on January 30, 1928, when the following attended:—

(1) The Hon'ble Mr. R. I. R. Glancy, C.S.I., C.I.E., I.C.S. (now Sir Reginald Glancy, K.C.I.E.), Agent to the Governor-General in Central India—*President.*

(2) Major Ellis Jones, M.L.C., *Vice-President* of the Indian Central Cotton Committee (in place of Dr. D. Clouston, C.I.E., who was unable to attend).

(3) Mr. B. C. Burt, M.B.E., Secretary, Indian Central Cotton Committee.

(4) Mr. C. R. Palairet, Member for Commerce and Industry, Holkar State.

(5) Mr. C. K. Chhaya, Agricultural Superintendent, Dhar.

(6) Mr. Nasrat Mahomed Khan, B.A., LL.B., Jaora; and

(7) Mr. A. Howard, C.I.E., Director of the Institute of Plant Industry, and Agricultural Adviser to States in Central India and Rajputana—*Secretary.*

Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E., M.L.A., was unable to attend on account of the meeting of the Legislative Assembly at Delhi.

At this meeting the Secretary announced that the recurring grants voted by the Central Cotton Committee had been increased to Rs. 1,30,000 in 1928-29 and to Rs. 1,15,000 in 1929-30. The revised estimates for 1927-28 were passed; the budget of 1928-29 was considered and sanctioned. It was decided to devote the savings of 1927-28 and 1928-29 to the formation of a closing balance (for ways and means purposes) of at least Rs. 5,000. The financial statements are printed in full at the end of this report.

The Secretary reported that a local audit of the accounts of the Institute (from October 24, 1924, to August 1927) had been carried out by the Accountant-General, Central Revenues, Delhi, and that the final objection statement contained nothing of importance and dealt only with a few trivial details. He stated that the present system of accounts and audit took up far too much of his time and energy and that it is absolutely essential in the interests of the Institute to terminate the present arrangements at the earliest possible date and to place the accounts and audit on a business footing. This was agreed to. Subsequently on March 3, 1928, the Government of India agreed in principle to this proposal. Steps were at once taken to incorporate the Institute under the Societies Act; the lines on which the Memorandum of Association and the Rules should be drafted were considered by the Finance Sub-Committee of the Central Cotton Committee at a meeting held on March 19, 1928; the actual Memorandum of Association and the Rules were then drawn up by Messrs. Craigie, Blunt and Caroe, Solicitors to the Central Cotton Committee; submitted to and approved of by the Contributing States and then forwarded (on April 19, 1928) to the President of the Governing Body for transmission to the Government of India. The formal sanction of the Government of India was received on June 30th, 1928.

Staff.—During the year Mr. W. J. Jenkins officiated as Director from July 1 to November 20, when he reverted to his permanent post as Deputy Secretary of the Indian Central Cotton Committee.

By July 1, 1928, the whole of the staff of the Institute will have been appointed. Mr. K. R. Joshi was promoted to the new post of Assistant in charge of Extension Work on April 1, 1928, in which he is doing well. He was succeeded by Mr. B. C. Tambe, who is fully justifying his promotion. Mr. M. L. Saksena, who has proved to be an excellent Personal Assistant, has been confirmed in his post by the Governing Body. For the chief posts in Chemistry and Botany, Messrs. Y. D. Wad and T. C. N. Singh have recently been appointed.

II. The General Equipment of the Institute.

At the time of writing (June 30, 1928) the preliminary work in connection with the creation of a modern Experiment Station for cotton and associated crops has been practically completed. The various buildings (including a library of nearly 4,000 volumes) have been fully equipped; all the roads and paths (20,062 feet in length) needed have been made and metalled; a drainage system for the whole area is in working order; forty-five fields of a total area of 250.38 acres have been laid out and are being prepared for experimental work; a grazing area of 16.25 acres has been cleared of trees and shrubs; the staff of the Institute has been recruited, trained and comfortably housed; there is a good supply of water for irrigation purposes; four sets of furnished rooms for visitors from the Contributing States and six quarters for visiting cultivators are available; the training of advanced students is in full swing and what is most important of all a number of practical results have been obtained which are being taken up in the villages. This has been carried out since work started in April 1925—in three years and three months.

Now that the preliminary work involved in the organization of the Institute has been completed, the scientific side will be developed as rapidly as possible on the lines of the programme already approved of by the Central Cotton Committee. This programme is as follows:—

Botanical Survey.—Up to the present, little or no attempt has been made in India to isolate, classify and study the unit species which form the frame-work of the various species and varieties of cotton found on the black soils. It is true that the Indian cottons have been classified and surveyed from the point of view of systematic botany, but this is entirely inadequate for modern work as by this method cottons of very different agricultural value are not distinguished. The work needs to be carried much further and nothing short of the isolation and study of the unit species will meet the case. This work has a direct practical bearing. It will, in all probability, lead to the isolation of useful types for distribution. It will also provide material for the plant breeder and for critical work on the physiology and agronomy of cotton.

Plant-Breeding.—Two main practical problems will be taken up at once :—

(1) the creation, establishment and maintenance of an island of improved cotton on the Malwa plateau. The types isolated will be available for other areas in India and the crop will enable a grade of improved cotton to be established for the mills and for the shippers ;

(2) the improvement of the fibre of the hardy Roseum type which is, in all other respects, admirably suited for the low-lying areas of Central India.

In the solution of these questions the inheritance of characters will have to be studied. The results will apply not only locally but will also be of general interest.

The Physiology of the Cotton Crop.—In order to increase production something more than improved varieties is needed. The new varieties must be provided with suitable conditions for growth. To discover these the physiology of the cotton plant must be studied and the factors which now limit production must be determined. This involves the study of root-development, the relations of the root-system to the soil type and the influence of factors such as soil moisture, soil aeration and drainage, soil texture and soil temperature on growth. Included in these studies is the discovery of the factors which produce the shedding of buds, flowers and bolls. During the course of these physiological studies, the general nutrition of the cotton plant will be considered and how far the yield can be improved by manuring and other methods of soil treatment.

The Influence of Environmental Factors on the Lint Characters.—Modern industries demand a uniform product. Once this is obtained the purchase of raw material as well as the details of manufacture are simplified. In the case of cotton, any tract which can produce uniform lint will rapidly establish its reputation in the trade. It is well known, however, that the cotton fibre alters in character according to the soil on which it grows and to some extent according to the season. Further work is desirable on this matter with the object of discovering what factors bring about these changes, which varieties are most easily affected and whether any practical remedies exist for improving the uniformity of the fibre of the same cotton. This portion of the work is of direct bearing on the question of the maintenance of grades of cotton for the highest class of spinning in this country.

III. The Work of the Year.

The rainfall during 1927 was 24.79 inches, which, although below the average, was well distributed during the monsoon period proper. During the first half of November, however, after the bolls began to open much damage was done to the cotton crop by two unexpected falls of rain amounting to nearly 4 inches, the second of which was accompanied by high winds. At least a quarter of the crop was lost altogether while the colour of the *kapas* was materially damaged. What promised to be a very fine crop exceeded the average of the locality (100 seers of *kapas* to the acre) by about fifty per cent. An area of 52 acres yielded 201.5 maunds of *kapas*—an average of just under four maunds per acre. The total amount of cotton was 55.5 maunds, a little more than one maund to the acre, the standard yield on the black soil areas of India.

The following details regarding the leased area will be of interest :—

	Acres.
Total area under cultivation—(plots 1-45)—including 18 acres commanded by existing wells	250·38
Grazing area east on the Bhil road	16·25
Ecological plots in Blocks A and B	2·43
Residential area, cattle paddock, Institute compound, farm buildings, compost factory, roads and paths, grass borders of fields, drainage canals and surface drains ..	30·94
Total ..	300·00

At least half of the 30.94 acres devoted to roads, buildings and so forth yields a good crop of grass so that the area lost in the lay-out is less than 5 per cent.

The area under crop in the *kharif* and *rabi* of 1927-28 was as follows :—

	Acres.	
Cotton	59·31	(including cultures).
Juar	34·31	
Tur	11·34	
San	34·54	
Ground-nuts	4·51	
Total *kharif* area ..	144·15	
Gram	51·32	
Wheat	38·20	
Linseed	4·10	
Irrigated Crops	4·83	
Total *rabi* area ..	98·45	

COTTON.

The great need in Malwa at the present time is a cotton which will ripen early before the cold weather sets in when damage by frost and by winter rains is frequent. The solution of this problem involved two things (1) the selection of an early ripening type and (2) the discovery of the factors which at present limit the rate of growth of the cotton plant. Results on both these aspects of the problem are being obtained and before long it is hoped to publish the detailed results.

Plant-breeding.—Considerable progress has been made in the work of isolating an improved variety of the local Malvi cotton characterised by rapid growth, high yield and early maturity with lint above the average of this variety. The number of single plant cultures has been reduced from 507 in 1927 to 48 in 1928. These are being grown on an even piece of land and it is hoped to make during the next two seasons a final selection for testing the lint, for rapid multiplication and for seed distribution.

The chief factor in the growth of cotton.—The chief factor which determines the yield of cotton on the black soils of the Malwa plateau is time. The best yields are obtained, the best produce is secured and the plant is best able to withstand heavy rain if the cotton plant grows rapidly from the beginning and comes into flower early. Any delay due to the choice of a late variety or any check caused by factors which hinder growth is paid for by a greatly reduced yield and by produce often damaged by frost and late rain. Two factors frequently limit the rate of growth—(1) imperfect surface drainage during July and August and (2) a shortage of combined nitrogen early in the season. A system of surface drainage, combined with the grading of the surface, has been devised for black soils and put into operation. This drainage system will also help in fixing the size of the holding and will therefore tend to prevent fragmentation. The problem of supplying the soil with combined nitrogen in a suitable condition has been solved. This is accomplished by the working up of all kinds of crop residues including green manures, weeds, cotton stalks, cane trash and so forth into Chinese compost. The secret of the process is to dry the various crop residues first of all and then to break them up finely before using them for bedding under the work cattle and for fermentation. A fine state of division is necessary to allow the cellulose decomposing organisms full play and for copious aeration during fermentation. The nitrogen starter is provided by the urine absorbed and by cattle dung. A base for neutralising acidity is best obtained by the use of ordinary soil and of wood ashes. Water and air are the only other things needed. The fermentation is carried out in pits 30′×14′ and 2½′ deep with sloping sides. During the past year nearly 700 carts of Chinese compost were prepared at the Institute. Now that the details have been worked out and the process speeded up, it is expected that at least 1,000 cart-

loads of this valuable manure will be produced every year from the crop residues and weeds yielded by the leased area. A compost factory consisting of 33 pits, each capable of holding 25 loads of finished compost, adjoins the cattle shed. This manure factory, in which the Indian ox is one of the essential factors and in which indigenous materials only are employed, now attracts many visitors. Adjoining the compost factory are seven silage pits, each $30' \times 14' \times 4 \cdot 5'$ deep. As these become free during the hot weather, they form a reserve set of compost pits when the ordinary factory is apt to be congested.

Root-development.—A preliminary survey of the root-development of cotton was completed during the year, the principal types used being Malvi, Bani, Roseum and Cambodia. This was carried out chiefly with the view of finding a suitable method of work and of discovering (1) what general differences exist in the types of root-system and (2) the effect of factors like soil-aeration and local water-logging on root-development. The preliminary results obtained will be of the greatest value when a detailed study of this important branch of work is taken up in earnest. Contrary to statements which have been made in the literature in India that the knapsack sprayer cannot be employed on black soils to expose the active roots, this method has given very good results at Indore. All that was necessary was to design a new type of nozzle for the spraying machines. Among the results obtained the following are of general interest :—

(*a*) The suitability of Roseum cotton for black soils appears to be bound up with a most efficient type of root-system which closely fits the soil type as well as the general moisture conditions.

(*b*) The failure of American types like Cambodia as a rain crop is a direct result of a type of root-system suitable only for irrigated conditions.

(*c*) The response of the root-system of cotton to improved surface drainage and to better soil-aeration is very marked thereby explaining the results obtained on ridges in Gujerat.

Classification of Indian cottons.—On account of our absence on leave during the cotton season of 1927, very little progress was made in the collection of unit species of the Asiatic cottons with a view of working out a modern classification of the cottons of India. During the coming season, the Board of Governors have authorised the creation of a new Junior Assistant's post for helping with this investigation. One branch of the work however was advanced, namely, the determination of the chromosome numbers of a series of Indian types. Twenty-eight Indian and four American types were examined by one of the senior Research scholars and a suitable method of procedure worked out. All the Indian forms contained 26 chromosomes very similar in appearance; the American types all contained 13 chromosomes. Denham's original results were therefore confirmed and extended. Full details of this work are to be found in a forthcoming paper in the *Annals of Botany*.

The eradication of perennial grasses.—Two perennial grasses, *kans* (*Saccharum spontaneum L*) and *kunda* (*Ischaemum pilosum* Hackel), are responsible for a good deal of the loss of yield of the cotton fields of large areas of Central India, the Central Provinces and Bundelkhand., A detailed study of the life history of *kans* is nearing completion and it is hoped to publish the results during the forthcoming year. The method of eradication by means of the converted middle buster has stood the test of time and there is no doubt that this implement, drawn by four oxen walking abreast, is exactly what is required. The stock of these implements has been sold out and the Board of Governors has sanctioned an implement advance of Rs. 2,000 for the sale of these ploughs, yokes and chains to the public. A new stock of 100 sets has been ordered which it is expected will be available for sale at Rs. 50 a set during the early rains of this year. A small area of *kans* has been preserved for further study. This weed is proving a valuable indicator of soil fertility and is yielding unexpected results which will be referred to in future publications.

Rotation crops for cotton.—One great need in the improvement of cotton production in Central India is a rapidly growing rotation monsoon crop which will also increase the nitrogen and organic matter content of the soil and if possible add to the fodder supply. Trials were made during the year of the Spanish pea-nut which is doing so well in Kandesh and Gujerat but which is new to Central India. Very good results were obtained and the produce has been widely distributed in the Contributing States. To cope with the demand for seed of cotton and ground-nuts which has arisen, it is proposed to lease the cultivated portion of the grounds of the Daly College both for the supply of Spanish pea-nuts and of improved cotton. This will serve a double purpose—the *Kumars* of the College will see for themselves the advantages of the ground-nut crop; the supply of seed for distribution will be greatly increased.

Distribution of improved cotton seed.—The mass selected Malvi cotton seed grown as a general crop on the leased area has been distributed to the cultivators of the Indore State for the last two years through the new Department of Rural Development.* The cultivators have found that this seed gives a better yield than the ordinary crop and a keen demand has arisen. During the past year 10,000 lbs. of this seed was sold for distribution in the villages. Only a portion of the demand could be met. In this connection the electrically driven gins and the new gin-house have proved a real boon. The new-gin-house is a model of its kind—the design of which is largely due to Mr. Palairet, Member for Commerce and Industry, Holkar State, who now represents the State on the Governing Body. The small electrically driven gins have proved equally successful in dealing with the produce of single plants and of pure lines.

IV. The Annual Cultivators' Meeting.

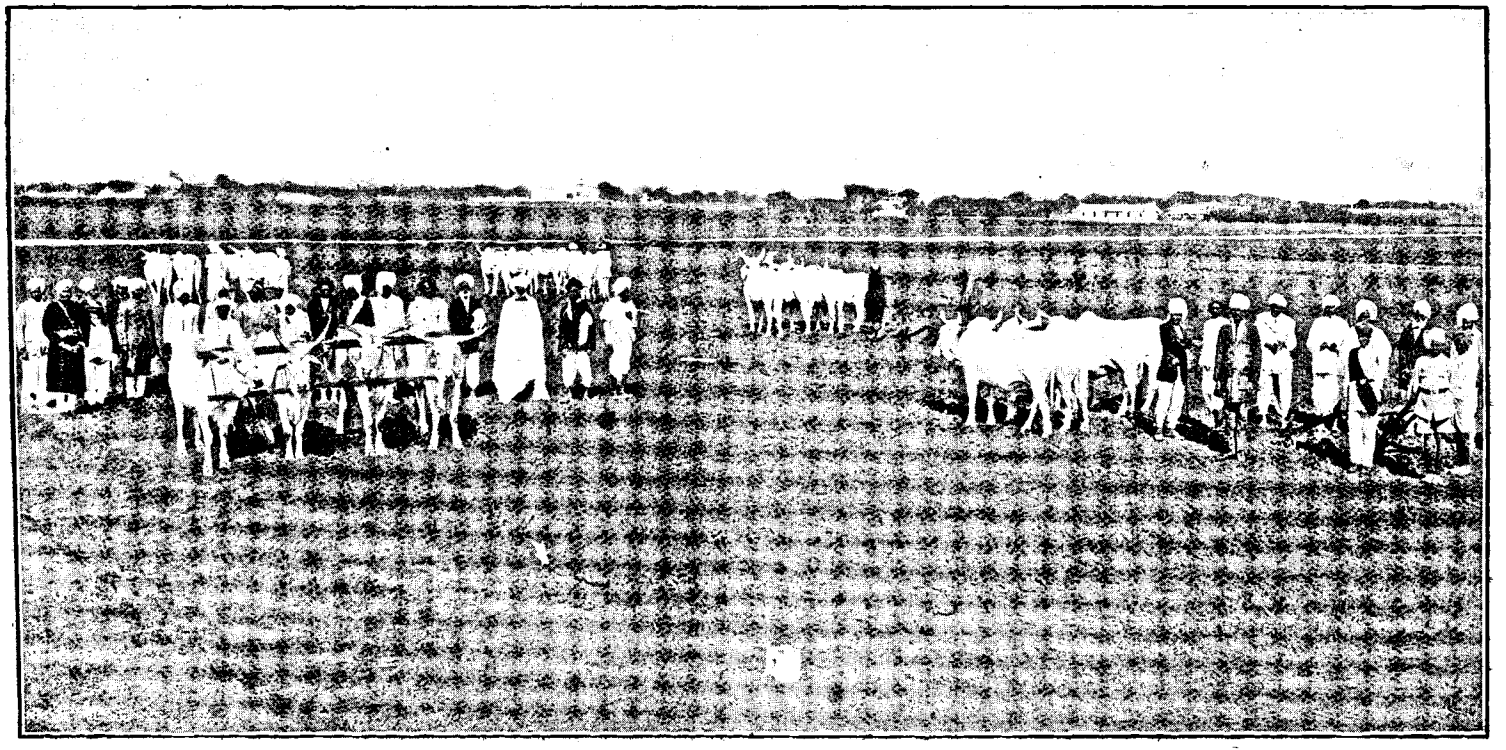
On January 28 and 29, 1928, the first cultivators' meeting took place, when about 200 cultivators (sent by the Contributing States to see the various improvements in agriculture which had been worked out by the Institute) came to Indore. The suggestion that such meetings should be held was made in December 1927 by Khan Bahadur Kazi Aziz-ud-Din Ahmed, C.I.E., Minister of Datia. The proposal was placed before the Darbars of the Contributing States and was so well received that immediate steps were taken to carry it into effect. Groups of cultivators, in charge of suitable State officers, were sent by the following States:—Indore, Datia, Dhar, Jaora, Ratlam, Barwani, Bijawar, Sitamau, Narsingharh, Tonk and Jhalawar. The cultivators were housed in two serais—one kindly lent by the Holkar State, the other by Sir Sarupchandji Hukumchand. They were transported to and from the Institute daily in motor lorries placed at the disposal of the Institute free of charge by the Holkar State and by the Malwa United Mills. Twelve demonstrations in all were given, six on each day. The meeting was a great success and was much appreciated. Since it took place, there has been a growing stream of visitors, many of whom are either local notables or well-to-do men who are beginning to take up improvements on their own land. It is proposed to make this cultivators' meeting an annual event, to develop it as time goes on and to hold conferences during the afternoons with the officers connected with extension work in the villages. This annual meeting should prove of great use in the establishment of an improved type of cotton in Malwa.

V. Training.

The training of advanced students nominated by the Central Cotton Committee and of officers sent by the Contributing States is now an important feature of the work of the Institute.

During the past year four students completed their training, namely—Messrs. Idnani, Talesara, Nanjudiah and Banerjee, the three former of whom have already received suitable appointments. Mr. Banerjee was placed on the short list for interview in connection with the post of Botanical Assistant in the Institute but the competition was so keen that he failed to secure the appointment. Mr. Idnani has received a post under the Bombay Government at the Sakrand Experiment Station in Sind, Mr. Talesara has been appointed a Junior Assistant on the staff of the Institute and Mr. Nanjudiah has been appointed to assist in cotton breeding work in the reorganized Agricultural Department of the Hyderabad State.

* In this new department, the activities of the old Agricultural and Co-operative Departments have been amalgamated.



Demonstrating the Eradication of Kans and Kunda.

At the moment, there are five students of the Central Cotton Committee in training at Indore—namely, Messrs. Sham Sher Singh, Thakur, Rane, Mathur and Kanti Raj. Mr. Sham Sher Singh was nominated during the first year of his scholarship for appointment as Agricultural Officer in the Bikaner State and will be in charge of the seed farm and agricultural work on the new Gang Canal on which cotton will be an important crop. I am glad to report that so far the experiment of selecting science graduates from the Indian Universities for work in Agronomy promises to be most successful. It is hoped to increase the number of University students in this branch during the next few years so that the demand which has arisen for trained men in Central India and Rajputana can be met. The difficulty that will have to be solved is not to find these men suitable employment but to keep them at the Institute long enough to receive the necessary training. By this means it is hoped to train and find employment for a number of picked men from the Universities whose influence in developing cotton production should be considerable.

During the year under review the Holkar State has founded a new monthly vernacular agricultural newspaper—*The Kisan*—which provides a useful means for making known to the people the results obtained at the Institute and also the general purposes of the Indian Central Cotton Committee. It is hoped to publish this year a series of articles on cotton markets. The first of the series has been contributed by the Secretary, Central Cotton Committee.

VI. Financial Statement, 1927-28.

A. *Receipts.*

	Rs.	a.	p.
Opening balance on 1st April 1927	7,767	7	6
Receipts 1927-28 (Central Cotton Committee, Rs. 1,33,333. Contributing States, Rs. 22,527-12-6. Income from Land and Miscellaneous Receipts, Rs. 9,112-2-2)	1,64,972	14	8
Refunded for Leave and Pension Contribution paid in excess	18	8	0
Total ..	1,72,758	14	2

B. *Expenditure.*

	Rs.	a.	p.
* Recurring Expenditure	1,21,958	8	8
Capital Expenditure	47,157	13	4
Closing balance on 1st April 1928 (including a sum of Rs. 18-8-0 paid in excess for Leave and Pension contribution and repaid into the fund)	3,642	8	2
Total ..	1,72,758	14	2

* This includes the sum of Rs. 1,000 drawn from the Treasury during the year to raise the Permanent Advance from Rs. 1,000 to Rs. 2,000.

Recurring Expenditure for 1927-28.

Head of Charge.	Revised Budget for 1927-28	Expenditure up to date 31-3-1928	Variations. Increase.	Variations. Decrease.
	Rs.	Rs.	Rs.	Rs.
1. Salary of the Director	27,210	27,584	374	..
2. House-rent	1,800	1,800	..	..
3. Salary of the 2nd I. E. B.	8,280	8,366	86	..
4. Leave and Pension Contributions of Officers	10,480	10,417	..	63
5. Pay of the Staff	22,300	22,180	..	120
6. Leave and Pension Contributions of the Staff	1,270	1,311	41	..
7. Provident Fund of the Staff.. ..	370	370	..	..
8. Medical attendance of Staff and Medicine	425	428	3	..
9. Rent of land	300	300	..	..
10. Fire Insurance and Protection ..	2,220	1,539	..	681
11. Audit Expenses	3,000	894	..	2,106
12. Cultivation and Plant breeding charges	24,300	26,170	1,870	..
13. Purchase and upkeep of machinery .	1,800	1,042	..	758
14. Laboratory apparatus	3,000	2,770	..	230
15. Books and periodicals	3,000	3,079	79	..
16. Miscellaneous — Stationery and Postage	6,200	8,555	2,355	..
17. Publications	350	229	..	121
18. Travelling allowance	5,000	3,924	..	1,076
Grand Total Rs. ..	1,21,305	1,20,958*	4,808	5,155

There is a nett saving of Rs. 347.

* This total does not include the Rs. 1,000 drawn during the year for increasing the P. A. to Rs. 2,000.

Capital Expenditure (Third Group).
(1926-27 and 1927-28.)

Head of Charge.	Budget grant.	Expenditure	Variations. De-crease.	Variations. Increase.
	Rs.	Rs. a. p.	Rs. a.	Rs. a. p.
1. Fourteen quarters and roads ..	33,333	8,622 4 0 24,030 6 0	680 6	....
2. Library—book-binding and periodicals	2,000	1,968 13 0	31 3	....
3. Tiled drains for laboratories ..	1,000	345 5 0	654 11	....
4. Retiring room and lattice screen ..	1,000	1,322 12 0	..	322 12 0
5. Engine for laboratory well	1,200	1,233 11 0	..	33 11 0
6. Pot culture house	3,000	4,297 1 0	..	1,297 1 0
7. Fitting dark-room, apparatus and chemicals	3,800	5,705 2 8	..	1,905 2 8
8. Alterations and additions to Chemical Laboratory store-room ..	..	761 13 0	..	761 13 0
9. Construction of well	..	629 9 0	..	629 9 0
10. Repairs to buildings	..	2,487 5 3	..	2,487 5 3
Total Rs. ..	45,333	51,404 1 11 or 6,071 1 11 in excess.	1,366 4	7,437 5 11

VII. BUDGET 1928-29.

A. *Income.*

		Rs.	a.	p.
1.	Opening Balance*	3,642	8	2
2.	Contributed by Central Cotton Committee	1,30,000	0	0
3.	From Contributing States	25,550	0	0
4.	Income from leased area	8,000	0	0
	Total ..	1,67,192	8	2

B. *Recurring Expenditure.*

1. PAY AND ALLOWANCES OF OFFICERS AND STAFF—

	Rs.	Rs.	a.	p.
Director's Pay and passage pay	29,740			
Director's House Allowance	1,800			
2nd Imperial Economic Botanist's pay	18,000			
Leave and Pension Contributions of Officers at 30 per cent.	14,510			
Pay of Staff	31,800	1,03,525	0	0
Leave and Pension Contributions of the Staff ..	1,450			
Provident Fund (Staff)	800			
Medical Attendance (Staff)	425			
Travelling Allowances of Officers and Staff	5,000			

2. CONTINGENCIES—

Rent of land	300			
Fire Insurance and Protection	750			
Audit Expenses	1,000			
Farm Expenses—Temporary Establishment, labour, plant breeding field experiments, repairs and upkeep of buildings and roads, running expenses of engines and gins, cattle food, farm supplies ..	24,000	42,669	0	0
Purchase and upkeep of Machinery	1,500			
Laboratory apparatus and Chemicals	3,000			
Books and Periodicals	3,000			
Miscellaneous—Stationery, Postage, Furniture, Carriage of Specimens	4,400			
Publications	2,000			
Unforeseen expenses in connection with extension work	2,719			

3.	CLOSING BALANCE	5,000	0	0
	Total including Closing Balance	1,51,194	0	0
	Carried forward ..	1,51,194	0	0

* In addition to this Rs. 3,642-8-2, the opening balance in the Treasury on 1st April 1928, a sum of Rs. 1,800 received from Datia State was paid in on 3rd April 1928. The real opening balance is therefore Rs. 5,442-8-2.

C. *Capital Expenditure (Fourth Group).*

		Rs.	a.	p.
	Brought over ..	1,51,194	0	0
1.	One block of six workmen's quarters to replace a temporary building now almost in ruins	3,981	0	0
2.	A similar block for visiting cultivators sent to learn improved methods	3,981	0	0
3.	A rest house for four Agricultural Assistants sent to the Institute for short periods	4,809	0	0
4.	Additions to the Institute :—			
	Shelving in 2 Store Rooms .. .. Rs. 947			
	Enclosing a portion of the verandah of the laboratory block for a new Store Room .. .. .. Rs. 506	1,751	0	0
	New table in Chemical Laboratory .. .. .. Rs. 98			
	Fixing an exhaust fan in the Dark Room .. .. Rs. 200			
5.	A new Elevator for Institute Well and the provision of a hand elevator on the well of the workmen's quarters (a necessary precaution against cholera)	2,000	0	0
	Total ..	16,522	0	0
	TOTAL EXPENDITURE (Capital and Recurring)	1,67,716	0	0
	TOTAL INCOME (including the Datia State contribution)	1,68,992	8	2

APPENDIX II.

EXCERPTS FROM THE REPORT OF THE ROYAL COMMISSION ON AGRICULTURE.

30. A recent development of considerable importance to Indian agriculture may here conveniently be mentioned. As the result of the Report of the Indian Cotton Committee of 1917-18, the Indian Central Cotton Committee was constituted in 1921 and was given definite legal status by the provisions of the Indian Cotton Cess Act of 1923. The Committee at present consists of 42 members in all. Three of these are appointed by the Government of India, of whom one is the Agricultural Adviser to the Government of India who is *ex-officio* president of the Committee. Nine members are representatives of the provincial agricultural departments, seven of cotton merchants and ginners, six of cotton spinners, eleven of cotton growers and six of Indian States. The secretary and assistant secretary are members of the Indian Agricultural Service. The work of the Committee falls under four main heads. It is concerned with the improvement of cotton marketing and the prevention of malpractices both by legislative measures and by constructive action. It is an advisory committee in regard to the policy—both agricultural and commercial—to be followed in promoting the development of cotton growing in the different provinces. It is a bureau of information for the agricultural departments, the trade and the general public. Agricultural and technological research on cotton is its special care. Technological research is under its direct control and it has its own technological laboratory in Bombay. Agricultural research is provided for by research grants to provincial agricultural departments for specific investigations and to the Institute of Plant Industry at Indore, which was established in 1924. This institute is practically a central research institution for cotton problems and, though subsidised by some of the Central Indian States, to which its Director acts as agricultural

The Indian Central Cotton Committee.

adviser, is mainly dependent on the grants it receives from the Central Cotton Committee. The finances of the Committee are provided by a cess of two annas a bale on all cotton used in mills in British India and exported from India. The cess is levied under the provisions of the Indian Cotton Cess Act of 1923. The present income of the Committee is about Rs. 6½ lakhs per annum.

The Indian Central Cotton Committee is, in short, a central body charged with the promotion of all measures which will tend to further the improvement of cotton growing in India. We have discussed its constitution and functions in some detail as the establishment for the improvement of a particular crop of an all-India organisation, on which all interests from the grower to the manufacturer are represented, marked a definite break with previous traditions. The Committee is so far the only one of its kind in India and one of the questions which we shall later discuss is the possibility of constituting a similar organisation for the improvement of other crops.

41. *Constitution of Crop Committees.*

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One of the most satisfactory features of our enquiry was the universal approbation elicited by the work of the Indian Central Cotton Committee, the organisation and functions of which we have described in paragraph 30, Chapter II. The marked success which has been achieved by that committee led to many suggestions that other crops should be dealt with in similar fashion and the possibilities of dividing up agricultural research by crops have, therefore, to be considered. These possibilities, however, appear to us to be very limited. Agricultural research cannot, in our view, be suitably divided into longitudinal sections in this way and any attempt to do so would involve more loss than gain. It must be remembered that the Indian Central Cotton Committee does not confine itself to research on cotton but is concerned with all questions arising out of cotton growing from the field to the factory. Nor does the research work which is carried out under its auspices embrace the whole field of research on cotton. It is supplementary to, rather than independent of, the work of the provincial departments on this crop.

Without in any way desiring to minimise the success which has attended the work of the Indian Central Cotton Committee, it must be remembered that cotton offered a specially promising field for the experiment involved in constituting such a committee. In the first place, the cotton problem is very definitely an all-India problem ; in the second, the cotton industry provides, to a greater extent than any other industry in India, except the tea industry, which has its own organisation, and possibly the jute industry, the personnel required for a successful central committee ; and, in the third, the question of financing the operations of a central committee for cotton presented fewer difficulties than would be encountered in financing those of any similar committees, again with the possible exceptions of tea and jute. It would be extremely difficult to provide a satisfactory personnel for central committees on such crops as wheat, the millets, oil-seeds or rice, and, even if such committees could be constituted, the field of research which would remain untouched would still be a very large one.

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43. * * * * * * * *

Constitution and functions of an Imperial Council of Agricultural Research.

(i) Promotion, guidance and co-ordination of agricultural research.

Our proposal is that an Imperial Council of Agricultural Research should be constituted. Before discussing the manner in which this Council should be composed, we would state our conception of the functions it should discharge. Its most important duty would be to promote, guide and co-ordinate agricultural research throughout India, and to link it with agricultural research in other parts of the British Empire and in foreign countries. It would not exercise any administrative control over the Imperial or provincial research institutions. Such control would remain, as at present, with the Imperial or provincial departments of agriculture. But it would be a body to which those departments could look for guidance

in all matters connected with research and to which such research programme as they might choose would be submitted for criticism and approval. Research programmes were formerly submitted to the Board of Agriculture for criticism but the practice has been discontinued as the Board did not feel itself in a position to perform this function satisfactorily. It would further be a body to which the Imperial and provincial governments could, if necessary, turn for advice as to whether their research work is proceeding on sound lines and is of such a standard that it commands respect and justifies the expenditure incurred on it. Our object, in proposing that such a body should be constituted, is, in short, to provide provincial governments with an organisation in which they can feel that they have a real and lively interest, which, unfortunately, is not the case with Pusa as at present constituted. That interest will undoubtedly be greatly accentuated if the Council is entrusted with the administration of funds with which it can supplement provincial activities in the matter of agricultural research. We cannot emphasise too strongly our view that agricultural research knows no provincial boundaries and that there are few, if any, research problems which do not affect agricultural development throughout India. Research on rice in Madras, for example, may be of profound importance to Bengal, and work done on the millets in any part of India cannot but be of value wherever they are grown. If agricultural research in this country is to develop satisfactorily, it is essential that continuity of policy should be secured. Only if the Council is placed in a secure financial position, beyond the possibility of being affected by financial vicissitudes, will it be able to embark upon a programme of ordered advance. We, therefore, propose that an agricultural research fund should be constituted by a grant of Rs. 50 lakhs from central revenues to which additions should be made from time to time as financial conditions permit. This is, in our view, the minimum grant which can usefully be made, and we have only been able to propose so low a figure on the assumption that provision for the cost of existing institutions and for the normal expansion, both of these institutions and of any others which it may be decided to establish, will be met from central or provincial revenues as the case may be. The Council of Agricultural Research and the Agricultural Research Fund should be constituted by an Act of the Imperial Legislature. The position of the Council of Agricultural Research in relation to the administration of the research fund would be analogous to that of the Indian Central Cotton Committee in relation to the funds raised under the provisions of the Indian Cotton Cess Act of 1923. Subject to such conditions as might be prescribed, the capital and income of the fund and any other funds received by the Council would be utilised in meeting its expenses and the cost of such measures as it might decide to undertake for promoting agricultural and technological research in the interests of agriculture in India. The powers of the Council would be regulated by rules issued by the Governor-General in Council in the Department of Education, Health and Lands similar to those issued under Section 15 of the Indian Cotton Cess Act. These rules would, *inter alia*, regulate the powers of the Council to enter into contracts, to appoint officers and servants, and to grant them leave, pay and allowances. They would further regulate the powers of the Council to incur expenditure and would provide for the submission of its budget to the Governor-General in Council for sanction and for the audit and publication of its accounts. They should also provide that its accounts and also a report containing a summary of the work done and of the research and investigations made during the preceding year, should annually be placed before the Imperial Legislatures.

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Personnel of the Council.

(*iii*) The members of the Council.

53. It is, in our opinion, very desirable that the Council should not be an unwieldy body as otherwise there is a danger that its activities might be in inverse proportion to its numbers. At the same time, it is obviously essential that all the major provinces should be represented upon it. We do not wish to lay down any rigid rules for the composition of the Council as we realise that an entirely satisfactory constitution can only be evolved in the light of experience. We would suggest that, at the outset, the Council might consist of thirty-nine members, inclusive of the Chairman and the two whole-time members. Eight of these would be nominated by the Government of India, of whom one would be

the Director of the Pusa Institute who, under the proposals we put forward in paragraph 58 below, would be a whole-time officer, one would be the Director of the Muktesar Institute, one would represent minor administrations under the Government of India, one would be a non-official elected member of the Council of State and two would be non-official elected members of the Legislative Assembly. The remaining two members would be representatives of the European and Indian business communities respectively. Agricultural research is so closely bound up with the trade and commerce of the country that we consider it desirable that these two important communities should be represented on the Council. There should also be three representatives of Indian universities nominated by the Inter-University Board. Touch between the Council of Research and the Indian Central Cotton Committee will be provided by the fact that the Chairman of the Council of Research will also be the Chairman of the Indian Central Cotton Committee, but we recommend that this Committee should also be permitted to elect a representative to the Council of Agricultural Research. In view of the value to Indian agriculture generally of the scientific work of the Indian Tea Association and the United Planters Association of Southern India, we would suggest that these two bodies should also jointly nominate a member of the Council. The provincial agricultural representatives would consist of the nine directors of agriculture of the major provinces.

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The remaining five members would be non-official members nominated by the Government of India on the recommendation of the Council, by reason of their scientific knowledge or other special qualifications, for the approval of the Government of India.

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The Agricultural Adviser to the Government of India.

58. The scheme we have outlined above leaves no place for the Agricultural Adviser to the Government of India. The duties of that appointment at present fall under two main heads, advisory and administrative. The Agricultural Adviser, as his designation implies, advises the Government of India on all matters of agricultural policy and acts in a similar capacity to provincial governments when he is called upon to do so. He is, as we have seen, in administrative control of Pusa, the Institute of Animal Husbandry and Nutrition at Bangalore, the cattle breeding and dairy farms at Karnal, Bangalore, and Wellington, the creamery at Anand, the Sugarcane Breeding Station at Coimbatore, and the Imperial Institute of Veterinary Research at Muktesar and its branch at Izatnagar near Bareilly in the United Provinces. In the administrative charge of Pusa, he has the assistance of a senior member of the staff as Joint Director. He is also *ex-officio* Chairman of the Indian Central Cotton Committee. Under the scheme we have put forward, his advisory duties would be transferred to the Chairman and the two whole-time members of the Council of Research, whilst the small but by no means unimportant part of his work which is connected with agricultural publications would be taken over by the Council. His administrative duties except in regard to the Imperial Institute of Veterinary Research at Muktesar, for which in our chapter on Diseases of Livestock and their control we propose parallel arrangements, should, we consider, be transferred to a whole-time Director of Pusa. That the administrative work connected with Pusa is sufficient to justify a whole-time appointment has already been recognised by the creation of an appointment of Director which has, however, remained unfilled pending the provision of funds. We consider that the Director of the Pusa Institute should also be in charge of the sub-stations now under the control of the Agricultural Adviser as it is very desirable that the agricultural activities in which the Government of India are directly concerned should be linked in this way. The Chairmanship of the Indian Central Cotton Committee and of any other crop committees which may hereafter be formed should, in our view, be taken over by the Chairman of the Council of Agricultural Research. With the establishment of that Council, therefore, the post of Agricultural Adviser to the Government of India would be abolished.

65. In Chapter II, paragraph 30, we have described the constitution and functions of the Indian Central Cotton Committee and, in paragraph 41, we have stated our view that the constitution of a number of similar committees for other crops does not offer a solution of the problem of advancing agricultural research in India. This problem must, broadly speaking, be dealt with as a whole and not in sections. At the same time, if any particular trade feels that its interests are not sufficiently recognised by the proposals we have put forward in regard to research generally, we see no objection whatever to the constitution of an organisation on the lines of the Indian Central Cotton Committee to deal with its special problems provided that it is willing to tax itself for this purpose. As we have explained, the Indian Central Cotton Committee is financed by a cess of two annas per bale on all cotton used in mills in British India and exported from India. The only other products on which a similar cess is levied are tea and lac. A cess of six annas is levied on every hundred pounds of tea exported and the proceeds of this, which now amount to over Rs. 12 lakhs per annum, are made over to the Indian Tea Cess Committee to be utilised in promoting the interests of the Indian tea industry. The money is spent mainly on advertisement and propaganda. A cess of four annas a *maund* on exports of lac and of two annas a *maund* on exports of lac refuse is also levied. The proceeds of this cess are administered by the Indian Lac Association for Research which was constituted in 1921. If any other trade is willing to submit to a similar cess for the purpose of promoting additional research on the product in which it is interested and, generally, of advancing the solution of all problems connected with the cultivation, marketing and manufacture of that product, it should be encouraged to do so, but such cesses should, in our view, be imposed only with the consent and at the instance of the trade.

Constitution of crop committees.

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We consider it most desirable that a Jute Committee which would watch over the interests of all branches of the trade from the field to the factory should be formed. The constitution of such a Committee should present no difficulty as it should be as easy to obtain as satisfactory a personnel for it, composed of representatives of the agricultural departments of the three provinces concerned, of growers, merchants and manufacturers as it has been for the Indian Central Cotton Committee. This is a matter in which the Government of India are very closely interested as they derive a large income from the export duties on raw and manufactured jute. These duties brought in a revenue of nearly four crores of rupees in 1926-27. In addition, there is a small cess of two annas a bale on raw jute and twelve annas per ton on manufactured jute, the proceeds of which go to the Calcutta Improvement Trust. In view of the fact that the export duty brings in so large a revenue to the Imperial Government which is, therefore, very directly interested in the prosperity of the jute industry, we consider that this is a case in which the expenditure on additional research and on the promotion of the interest of the trade generally should be met from central funds. Our recommendation thus is that a Central Jute Committee should be formed on the lines of the Indian Central Cotton Committee and that it should be financed by an annual grant of Rs. 5 lakhs. The necessary link between the research work on jute and all-India research work would be provided by the appointment of the Chairman of the Council of Agricultural Research as Chairman of the Central Jute Committee.

Introduction of improved varieties of crops.

97. Considerable as have been the achievements of the agricultural departments in India in introducing improved varieties of crops, the percentages given in the Table above are in themselves sufficient to show that there is still a vast field for further work in this direction. Much remains to be done even in respect of crops such as cotton, jute and wheat where the success of the departments has been most marked. We received evidence, for example, which showed that the 4F variety of American cotton, which is now grown on approximately one million acres in the Punjab, is undergoing deterioration, apart from the effect on the quality of the crop produced by the mixing in the ginneries of American cotton with the indigenous short-stapled varieties. There appeared to be some difference of

(ii) Future work.

opinion as to whether the deterioration is merely temporary and due to the passing effect of unfavourable seasons or whether it is permanent and has resulted from cross fertilisation in the field between plants which have diverged from the original type selected and from the continued renewal of the seed supply from contaminated sources. In this case, seasonal influences have no doubt been at work; but experience elsewhere renders the latter explanation a probable one. The falling off in the quality of the 4F variety is only one example of the well-known need for reselection that arises in most forms of crop improvement work. It shows how essential it is that the agricultural departments should be ready either to undertake the difficult and tedious process of eradicating deterioration once it has appeared in a crop or to replace the deteriorated strain by another.

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98. There has been a tendency in recent years on the part of most provincial departments, which has been accentuated by the influence of the Indian Central Cotton Committee, to appoint specialists for work on particular crops. A number of specialists are now engaged on work on cotton, Madras has a millets and a paddy specialist, the Punjab a specialist on cereals—to mention only a few examples. We recognise the importance of specialisation; the improvement of one important crop such as cotton may indeed call for the combined efforts of a number of specialists. But we received evidence from scientists in England to which we attach great weight, which went to show that specialisation is not without disadvantages. It was urged that work on a particular crop would, in all probability, prove of greater value if it were combined with work on another entirely different crop of secondary importance. An expert working on cotton would, for example, gain in freshness and preserve a broader botanical and biological outlook if he were to combine his work on cotton with work on some other crop which enters into the rotation with it. We commend this view to the attention of those responsible for the administration of the agricultural departments in India.

(iii) Appointment of crop specialists.

100. *Spread of improved varieties.*

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Whilst due consideration must be paid to the preference on the part of the grower for a higher yielding variety over one of better quality, circumstances may arise in which it may be desirable that the agricultural departments should take a longer view of what is required in the best interests of the cultivator. Attention to quality may, in the long run, prove more profitable to him than attention to yield. We have in mind the case of the short-staple cotton known as *roseum* in the Central Provinces and Berar. This cotton, the staple of which is only four-eighths to five-eighths of an inch, is still the most paying variety of cotton the cultivator in those provinces can grow on land free from wilt disease, and its introduction has, during the last fifteen years, brought many crores of increased income to the cultivator. But there are now indications that a cotton of better quality, which will yet yield the grower a profitable return, is required owing to the tendency of the mills in India and Japan to spin yarn of finer counts. We would add that the Agricultural Department in the Central Provinces is fully alive to the signs of change in the position and that there is every reason to believe that, when the time comes to replace *roseum* by cotton of longer staple, suitable types of the latter will be available. The past and the probable future history of *roseum* shows how essential it is that the agricultural departments should keep in the closest touch with the trend of the world's markets and should frame their policy in regard to plant-breeding accordingly.

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113. *Crop Protection.*—
(*a*) *External*—

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The Destructive Insects and Pests Act of 1914 governs the import into British India only of material likely to cause infection to crops. It would seem that, when the Act was passed, the importance of securing the co-operation of the maritime Indian States

was not sufficiently realised. The necessity for obtaining this has recently become prominent owing to the occasional importation of East African cotton seed into ports in the Kathiawar States and the consequent danger that the Sudan boll-worm (the African red boll-worm, *Diparopsis castanea*) may be brought into this country. The Indian Central Cotton Committee has under consideration the question of enlisting the interest of the Darbars of the Kathiawar States in making at their ports arrangements designed to prevent the occurrence of a calamity of this nature. We trust that the Government of India will take steps to draw theattention of the Darbars of all maritime States to the urgent need of guarding against a danger that threatens the agricultural prosperity of the whole of India, including that of the States in question. We also hope that it may be found possible at an early date to secure the co-operation of the maritime States in measures designed to give security against the possible introduction into India of plant pests of whatever nature, and not only of those peculiar to the cotton plant. Otherwise internal measures against infection may become necessary in future and these will give rise to problems of far greater difficulty than those presented by protection against infection from outside India.

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(*b*) *Internal protection*—

(*ii*) Protection against deterioration due to mixing of seed.

115. The only crop in respect of which the deterioration resulting from the mixing of seed has been so marked as to necessitate special measures for dealing with it is cotton. The reason for this is that cotton has so far been the only crop in India for which it has proved worth while to import an inferior variety from one tract into another with the deliberate purpose of adulteration. In the Punjab canal colonies, where two distinct species of cotton, one comprising the short-stapled indigenous varieties and the other the longer stapled American varieties, are grown in the same tract, a recent survey conducted by the Indian Central Cotton Committee has shown that mixing by the cultivator is negligible and that the two species are marketed separately but mixed deliberately at the ginning factories. Deterioration owing to mixing has thus been due to commercial rather than agricultural conditions. In these circumstances, the grower of cotton cannot be held responsible for it.

Under the Cotton Transport Act III of 1923, an all-India Act, based on the recommendations of the Indian Cotton Committee as modified by the Indian Central Cotton Committee, a local Government, with the approval of the Legislative Council, may notify any area in which cotton of superior quality is grown and may prohibit the importation by rail, road or sea into such an area, except under license, of ginned or unginned cotton, cotton seed or cotton waste. The provisions of the Act were put into force soon after it became law in two areas in the Bombay Presidency and have recently been enforced in three areas in the Madras Presidency. In the areas in which it has been enforced, the Act is proving effective in checking the more flagrant forms of abuse but it cannot be applied to conditions such as exist in the Punjab canal colonies, where, as stated above, short and long staple varieties are grown in the same tract. It is hoped that the Cotton Ginning and Pressing Factories Act, also an all-India Act, which became law in 1925, and under the provisions of which mixed, adulterated or damped cotton can be traced back not only to the factory which ginned and pressed it but also to the original owner will enable such malpractices as those which have led to the deterioration of Punjab cotton to be stopped. The Act has not, however, been in force sufficiently long to show how far this anticipation is likely to be realised. Should it prove unfounded, other means of dealing with the situation will need to be devised. We do not consider it necessary to discuss the form these should take as we have every confidence in the ability of the Indian Central Cotton Committee to deal adequately with this and all other questions affecting Indian cotton. We feel it necessary, however, to state that the evidence we have received entirely supports the view taken by that committee of the seriousness of the deterioration of Punjab cotton which has resulted from the mixing of seed in the ginning factories,

Irrigation in Sind.

291. (*ii*) *The principles to be adopted in disposing of Government land.*

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In this connection, we are impressed by the many advantages attaching to the planting of extensive and homogeneous areas with a single variety of cotton well suited to local conditions. Where this can be achieved, the risk of deterioration by cross-fertilisation between the improved variety and inferior cottons is removed. Furthermore, the fact that local ginneries handle no cotton other than the approved variety insures to the cultivators a supply of pure seed at the lowest possible cost. Again, marketing arrangements are greatly facilitated by the existence in the tract of a large volume of one variety of high class cotton. Purchasers soon discover that cotton from such a tract can be relied upon both for purity and quality. The reputation of the district for cotton is established and soon becomes widely known, and, if marketing arrangements are satisfactory, the cultivator is thus assured of the maximum premium for the high quality of his produce. The information at our disposal goes to show that, in the Indian State of Rajpipla, where regulations have been enforced over a period of four years compelling the cultivator to grow cotton of an approved variety, highly encouraging results have already been obtained. Again, Government in the Sudan have taken power to enforce the creation and maintenance of areas in which one variety of cotton only is grown. Here also results have, we are told, entirely justified the wisdom of this provision. With these facts in mind, we would suggest to the Government of Bombay that they should very carefully examine the possibilities of attaching to occupancy rights in Crown lands to be newly colonised as part of the Sukkur Barrage scheme, the obligation to sow only such cotton as may be provided or approved by the Department of Agriculture. The cotton of the entire tract could then be kept pure by the application of the Cotton Transport Act. We are well aware that such a suggestion involves a departure from existing practice, but we are of opinion that the benefits in terms of financial advantage to the cultivator and to the community are likely to be so considerable as fully to justify a bold experiment in the direction indicated.

322. *Absence of information in regard to marketing conditions.*

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Some valuable investigations on the marketing of cotton are in process of being carried out by the Indian Central Cotton Committee. But much of the information essential to an exhaustive study of marketing conditions has never yet been collected. In a subsequent paragraph, we make suggestions for the organisation of marketing surveys and for the training of the necessary personnel. A brief description of the systems under which cotton is marketed in Khandesh, jute in Bengal and rice in Burma, based on such material as is available, will enable the reasons for the proposals we shall make for the establishment of properly regulated markets to be more readily understood.

The marketing of cotton in Khandesh.

323. The investigations of the Indian Central Cotton Committee have shown that the cultivators of cotton in the Khandesh districts of the Bombay Presidency are not hampered by indebtedness in selling their produce to the same extent as are cultivators in some other tracts such as North Gujerat and are comparatively free to dispose of it as they please. The commonest method of sale is, however, in the village to a visiting trader or more rarely to a resident trader. These traders are often financed by ginneries and by brokers known as Adatyas. Money-lenders seldom purchase the unginned cotton. A considerable number of cultivators sell in the larger markets, the proportion being much higher in West than in East Khandesh. In the two largest markets, the number of carts of unginned cotton brought in by actual growers represented sixty and twenty-seven per cent. respectively, of the total number of carts coming into those markets. In the smaller markets it varied from twelve to eighty-five per cent. The system of sales adopted in the markets is everywhere much the same. The carts collect in the early morning, the brokers show samples to the merchants, bids are made secretly between them under a cloth and the seller accepts the rate fixed. These samples, con-

sisting of as much as five to eight *seers* from each cart, are invariably regarded as the perquisite of the merchant, whether or not a sale is effected. No memorandum is given to the seller at this stage. The carts are then removed to the ginning factories where weighment and often the real bargaining take place. Allowances are frequently claimed on the ground that the cotton is not up to sample, or is damp or has a low ginning percentage. Such claims are made after weighment is begun and the cultivator has usually no option but to accept the new rate. A memorandum of the weight and rate is given to the cultivator and it is on this that payment is made. The enquiries made by the Indian Central Cotton Committee elicited definite instances in which deductions were made from the rate of the day, first in the market and subsequently in the ginning factory. Sellers in almost all markets are compelled to employ a broker and cannot sell direct. In some markets Indian firms buy direct from the seller's broker, in others, they employ brokers. Foreign firms always employ brokers. In a few markets brokers act for both buyers and sellers. The rates are calculated by the buyers on the basis of prices telegraphed from Bombay. In the Dhulia market in West Khandesh, the practice of posting the local rate of the day for unginned cotton is now adopted. No system of posting these rates in the markets exists elsewhere and, in all cases, the cultivator is dependent on buyers or brokers for information about rates. The system adopted for paying the men employed to weigh the cotton varies greatly from market to market. In some cases, weighmen are paid by the buyer, in some by both buyer and seller. In other markets, the weigher is the employee of the broker or the gin owner. The charges levied also differ greatly from market to market. At Amalner, the biggest market in East Khandesh, they consist of a charge of two annas per cart for ground rent and Rs. 2-0-6 for brokerage and other charges. These charges are levied on unginned cotton weighing more than 432 *seers* and less than 792 *seers*. Of the total of Rs. 2-0-6, As. 8 is levied for weighing, As. 2-6 for porterage, Rs. 1-2-6 for commission and As. 3-6 for charities. A fixed allowance of five *seers* per cart is also taken by buyers, representing a loss to the seller of from one rupee to 2½ rupees. The enquiries made by the Indian Central Cotton Committee showed that greater use of the markets is not made by cultivators because of the disputes which arise after the weighment has commenced in regard to the rate and because of arbitrary deductions from the weight.

The Berar market system and the Bombay market legislation.

328. The disabilities described in the preceding paragraph which undoubtedly exist in almost every unregulated market in greater or less degree, and are not entirely absent from the regulated markets of Berar, can only be removed by the establishment of properly regulated markets and we hold that the establishment of such markets would confer an immense boon on the cultivating classes of India. It must, indeed, in our view, form an essential part of any ordered plan of agricultural development in this country, for only in this way can the work of the agricultural departments be brought to full fruition. The markets of Berar are regulated under the provisions of the Cotton and Grain Markets Law. Markets of the character we have in view will also be established in Bombay when the Act to which we have referred above is brought into operation. The value to the cultivator of the markets in Berar has been brought out in striking fashion by the enquiry into the marketing of agricultural produce in that tract which has recently been conducted by the Indian Central Cotton Committee. It was found that no less than 68 per cent. of the cotton sold in that province was sold in these markets. In the neighbouring district of East Khandesh in the Bombay Presidency, only 8.5 per cent. of the cotton sold was brought into the larger markets. A brief description of the Berar system and of the improvements which the Bombay legislation seeks to graft on it is, therefore, a necessary preliminary to the recommendations we have to make on this important subject.

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Standardisation of weights and measures.

339. The establishment of properly regulated markets should act as a powerful agent in bringing about a reform which is much needed, primarily in the interests of the cultivator and, secondarily, in that of all engaged in trade and commerce in India. From all parts of India, we received evidence of the disabilities under which the cultivator labours owing to the chaotic condition in which matters stand in respect of the weights and measures in general use in this country and the hampering effect this has

upon trade and commerce generally. Needless complications and unevenness in practice as between market and market tend to prejudice the interests of the cultivator. In sixteen markets of the East Khandesh district of the Bombay Presidency, the *maund* has thirteen different values ranging from 21½ *seers* at Bodwad to 80 *seers* at Pachora. The Indian Cotton Committee pointed out that, over the greater part of the Bombay Presidency, cotton is bought and sold on the basis of a *khandi* of 784 lbs. of lint which is, in consequence, known as the Bombay *khandi*. In the south of the Presidency, the unit is the *nag* of 336 pounds. In Khandesh the *khandi* varies from 160 to 250 pounds. The Madras *khandi* is only 500 pounds of lint but, in the tract in which 'Westerns' cotton is grown, the unit is the *nag* of 312 pounds. At Cawnpore, there is a special cotton *maund* of 50 standard *seers*, that is about 103 pounds, both for lint and *kapas*. In other parts of the United Provinces, the standard *maund* of 82 2/7 pounds is generally used for *kapas*, lint being sold in bales of 400 pounds. Again, in the Punjab, we were informed that, in the Jhelum district, six different measures by which grain is bought and sold are found within an area of sixty square miles. In the western districts of Burma, the size of the basket used for measuring agricultural produce, such as rice and groundnuts, is now defined from district to district by the number of condensed milk tins, the contents of which it will hold. In the eastern districts, the measure is a tin which holds twice as much as a condensed milk tin. Innumerable other examples of a similar character could be cited but those given are sufficient to show that there is considerable justification for the view taken by both the Indian Cotton and the Indian Sugar Committees, and by many witnesses before us, that the present lack of system affords great opportunities for cheating the cultivator, of which unscrupulous dealers and others are not slow to avail themselves. Model by-laws prescribing the use of standard weights and measures have been framed by some local Governments and have been adopted by municipal councils and district boards. It would, however, appear that they are usually ineffective in practice because the public does not know of their existence and there is no proper system of inspection.

340. *Reputation of Indian agricultural products in the world's markets.*

(i) *Cotton.*—Cotton, which, in point of value, stands easily first in the list of Indian exports of raw produce, is the commodity in regard to which complaints of quality are most common both in India and in Europe. In spite of the work of the Indian Central Cotton Committee, and of the joint action by cotton trade associations which the Indian Central Cotton Committee is now endeavouring to secure, adulteration, mixing and damping still prevail to an undesirable degree. It has yet to be seen how far these malpractices will be checked by the operation of the Cotton Ginning and Pressing Factories Act of 1925, under the provisions of which mixed, adulterated or damped cotton can be traced back not only to the factory which ginned it but also to the original owner. It will be obvious that the prevalence of the practice of mixing short with long staple cotton very seriously hampers the work of the agricultural departments in spreading improved varieties. In paragraph 115, Chapter IV, we have pointed out that the position in respect of Punjab-American cotton is specially serious.

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Remedies for unsatisfactory quality.

341. Sufficient has been said to show that there is considerable room for improvement in the quality of much Indian produce as it is now marketed. It is impossible to apportion the responsibility for the conditions we have described in the preceding paragraph between the cultivator and the middleman or, again, to decide to what extent the malpractices complained of are merely the result of carelessness or are due to dishonesty. The Indian Cotton Committee found that the malpractices in regard to cotton for which the cultivator and the village trader are responsible are of minor importance compared with those carried on in ginning and pressing factories. Similar investigations have yet to be made in respect of other products. In so far as the cultivator must be held responsible for the condition in which his produce is marketed, it must, in justice to him, be pointed out that imperfect methods of preparation often arise out of circumstances over which he has no control. The bad retting of jute and hemp, for example, which is attributed to the use of dirty water, must frequently be due to the fact that clean water is not available.

But whether the adulteration, mixing and damping of Indian agricultural produce are due to the middleman or the cultivator, it is unquestionable that they react most unfavourably upon the price the cultivator receives for his produce and that he will never secure the full premium for quality unless an end is put to them. It is difficult to suggest a remedy suitable in Indian conditions. It must be recognised that little help can be expected from the individual middleman, whether in India or abroad. His main concern is with the extent of his margin and the volume of his turnover. His interest in improving quality in India becomes even less active if he is dealing with produce from several countries. He can always protect himself by allowances for inferior quality which are often more than proportioned to the intrinsic inferiority of the produce.

Appropriate action in respect of cotton can be, and is being, taken by the Indian Central Cotton Committee and similar action in respect of jute would be one of the first tasks of the Jute Committee, the establishment of which we have recommended in Chapter III. As for other products, the Board of Agriculture in 1917 suggested that the most hopeful method of attacking the problem by action on the part of Government was by control at the port of export and the refusal to allow the export of produce below a certain standard of cleanliness and purity, such a standard to be fixed by, or in consultation with, representatives of the trade both in this country and in the countries to which the bulk of the produce is exported. In the United States of America, grading under Government regulation and enforced by the Federal Department of Agriculture through inspecting officers, either at the port of shipment or elsewhere, is a prominent feature of the marketing for export of various agricultural products. Similarly the grading of hemp in New Zealand and of fibres for export from the Philippines is controlled by the agricultural departments of those countries. We have considered the feasibility of introducing schemes of this nature in India. We think, however, that, in the present state of development of the export trade, the administrative difficulties involved would prove insuperable.

Organised trade associations in India can, however, give great assistance. We would, in this connection, mention the valuable help which the East India Cotton Association, by changes in its system of allowances, has given the Indian Central Cotton Committee in its efforts to furnish a general incentive to the delivering of cleaner and better produce. This association, though representative of all sections of the cotton trade, including exporters and millowners, is primarily an association of merchants, middlemen and brokers.

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343. *Auction sales.*

We consider that auction sales by the agricultural departments provide a useful means of securing to the cultivator an adequate premium for the superior quality of a new variety grown under their supervision. Particularly is this the case in the early stages, when the quantity available is small and the trade is without an organisation to enable it to be taken up at its intrinsic value. The rapid expansion of the cultivation of 4F cotton in the Punjab and of the improved varieties of cotton introduced by the Bombay Agricultural Department in South Gujerat and the Southern Maratha Country was undoubtedly due in very large measure to the fact that, at the outset, the cotton of these varieties was graded and sold at auctions held by the Agricultural Department. As soon as their object had been achieved the auctions were discontinued in the Punjab and in South Gujerat and, in the Southern Maratha Country, they were taken over by co-operative sale societies. Auction sales by the agricultural departments, can, however, only be regarded as a temporary expedient. The departments have not sufficient staff available to enable them to handle very large quantities of produce nor is it desirable that their energies should be diverted to any great extent to the discharge of this task. We consider that government auctions should only be continued until they can be taken over by co-operative societies or by private agencies which are willing to co-operate with the agricultural departments in any measures the departments may consider necessary to secure an adequate premium for an improved variety or to maintain their control of seed. Occasions may arise when auctions may prove the most suitable means of reviving a trade market which has become temporarily demoralised.

348. The market surveys we have recommended in the preceding paragraph will be of little value unless they are carried out under proper supervision such as that of the Indian Central Cotton Committee or the Board of Economic Enquiry in the Punjab. The Universities could also render valuable service in conducting them. In western universities, work of this kind has from time to time been subsidised by special grants made by Government or other outside authority for that purpose. Such surveys have also been made the subject for those submitted for university degrees. Work on similar lines might well be done in India with some financial assistance from Government. But market surveys carried out under the supervision of these agencies will not in themselves be sufficient and we are strongly of opinion that the whole question of marketing requires to be dealt with by an expert officer. We, therefore, recommend that a whole-time officer of the status of Deputy Director of Agriculture should be attached to the staff of the Agricultural Department in each of the major provinces. His duties, at the outset, would consist mainly in the collection of information. The investigations into marketing conditions would be carried out under his supervision in collaboration, where necessary, with the Indian Central Cotton Committee, the Board of Economic Enquiry, where one exists, and the universities.

Appointment of an Expert Marketing Officer.

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525. *Publications.*

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The *Indian Trade Journal* also publishes, weekly, a statement of the amount of cotton pressed in the different provinces compiled from information which the pressing factories are required to supply under the provisions of the Cotton Ginning and Pressing Act of 1925.

The use of the *Indian Trade Journal* as the sole medium for the publication of forecasts is not satisfactory. The former practice of publishing them in leaflet form should be revived. A delay in the publication of a forecast by even a few days in order to conform with the publishing date of a weekly journal is obviously undesirable. Moreover, a leaflet can be sold at an anna or less whilst the *Trade Journal* costs four annas. This difference in price greatly curtails circulation. Arrangements should also be made for the issue of forecasts in the vernacular and for their supply to cultivators through such agencies as post offices, village libraries, co-operative societies and agricultural associations.

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Crop statistics (special).

532. The improvement in cotton statistics which has been effected by the efforts of the Indian Central Cotton Committee deserves mention here, not only for its own sake but because it furnishes an example of the statistical benefits to be obtained from a thorough organisation of all interests connected with a particular crop. As a result of the enactment of the Cotton Ginning and Pressing Factories Act of 1925, returns of the cotton baled in cotton pressing factories throughout British India are now published weekly in the *Gazette of India*. Monthly returns of the cotton consumed in Indian mills are similarly published and, as the Committee have been able to make arrrangements in the principal cotton-growing provinces for voluntary returns of the unbaled cotton received by spinning mills, statistics of the commercial crop of Indian cotton are now available in a fairly complete form. Recently also, partly at the instance of the Committee, the rail-borne trade returns for cotton have been partially revived. These returns, which were formerly compiled not only for agricultural produce including live stock but also for the manufactured articles and treasure, were discontinued from 1921 as a measure of economy, except in the Central Provinces. The question of reviving them for products other than cotton is discussed in the following paragraph. Used in combination with the weekly statistics of cotton pressed, the figures for cotton provide a most valuable independent check on the quantity of cotton produced in a province or a particular trade block as estimated by the agricultural or other department responsible for the preparation of forecasts. The cotton statistics should, in future, be as nearly accurate as it is possible for statistics of Indian crop production to be.

(iii) Cotton.

533. *Trade statistics.*

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A general review of trade statistics does not fall within the scope of our enquiry but we are constrained to comment on the situation created by the discontinuance of the annual returns of rail and river-borne trade. For the purposes of these returns, each province was divided into five or six trade blocks and India, as a whole, including Indian States, into eighteen blocks. The provincial returns were published by the local governments and the consolidated return for all-India was compiled and issued by the Department of Statistics.

Owing to the discontinuance of the returns, information regarding the movements of agricultural produce within India is now altogether lacking. This information would have been of very great value to us in our enquiries. We have pointed out in our chapter on Communications and Marketing, and elsewhere in this report, that it is most important, in the interests of the cultivator, that the marketing of his surplus produce should receive expert attention. No analysis of the marketing situation in a particular province, or in India as a whole, which has any pretensions to completeness can be made in the absence of data in regard to the relative importance of external and internal markets. This information is of little use if it is obtained by special enquiry for a single year. A comparison of returns over a number of years is required in order that any change in marketing tendencies may be detected and the knowledge used in the cultivator's interests. Apart from the need of such information, if the marketing question is to be studied intelligently, statistics of inter-provincial trade movements have at least two other important uses. They enable each province to ascertain how far it is dependent on other provinces in respect of foodstuffs and they show the rate at which that dependence is increasing or diminishing. This information should be of vital importance in the event of failure of crops on a large scale. Further, as we have pointed out with reference to cotton, they furnish a valuable independent check on the present method of compiling statistics of agricultural production from the factors of areas sown, standard outturn and condition estimate. We, therefore, strongly support the Resolution, passed by the Board of Agriculture in 1924, that they should be revived forthwith in their entirety and not for cotton only. As it is, a gap of several years will have intervened and this gap will seriously diminish the value of the returns for some time to come.

APPENDIX III.

(A)

NOTIFICATION AND RULES.

No. 278.—Notification under Section 3 of the Cotton Transport Act, 1923 (III of 1923), as amended by the Cotton Transport (Amendment) Act, 1925, XXXIV of 1925.

WHEREAS it is necessary for the purpose of maintaining the quality and reputation of the cotton grown in the areas in the Madras Presidency mentioned in Schedule I hereto appended.

Now, therefore, in exercise of the powers conferred by sub-section (i) of Section 3 of the Cotton Transport Act, 1923 (III of 1923), as amended by the Cotton Transport (Amendment) Act, 1925 (XXXIV of 1925), and in supersession of the notification No. 344, dated 18th November 1925, at page 2244, Part I of the *Fort St. George Gazette*, dated 24th November 1925, the Governor acting with his Ministers is hereby pleased to prohibit the import of cotton (*kapas*, ginned cotton or cotton waste) into the said areas by rail and sea save under and in accordance with the conditions of a licence prescribed in this behalf.

(2). The Governor acting with his Ministers is further pleased to prohibit under sub-section (2) of Section 3 of the said Act, the delivery to, and the taking of delivery by, any

person at any railway station situated in any of the protected areas and specified in Schedule II hereto appended, of any cotton (*kapas*, ginned cotton or cotton waste) when such cotton has been consigned from a railway station not situated in the said area unless such person holds the prescribed licence for its import into the said area.

(3). The transport of cotton seed into the protected areas as defined in Schedule I is exempted from the operation of clauses (1) and (2) and permitted without restriction.

(B)

SCHEDULE TO NOTIFICATION.

Schedule I—Protected Areas.

I. *The Northerns and Westerns Area.*—Consisting of the districts of Kurnool, Bellary, Anantapur and Cuddapah.

II. *The Southerns Area.*—Consisting of the districts of Chingleput, South Arcot, Chittoor, North Arcot, Salem, Coimbatore, Trichinopoly, Tanjore, Madura, Ramnad and Tinnevelly.

Schedule II.—Railway Stations.

I. *The Northerns and Westerns Area.*—All stations from Kottur to Hospet both inclusive, from Rayadrug to Bellary both inclusive, from Hospet to Guntakal both inclusive, from Guntakal to Hindupur both inclusive, from Guntakal to Tungabhadra river both inclusive, from Dharmavaram to Tanakallu both inclusive, from Guntakal to Cumbum both inclusive, on the Guntakal-Bezwada line, from Dhone to Kurnool both inclusive and from Guntakal to Settikunta both inclusive.

II. *The Southerns Area.*—All stations from Mambalam to Dhanushkodi Pier both inclusive, from Chingleput to Arkonam both inclusive, from Villupuram to Katpadi both inclusive, from Villupuram to Chinnababusamudram both inclusive, from Mayavaram to Tranquebar both inclusive, from Mayavaram to Arantangi both inclusive, from Tiruttu-raippundi to Agastiyampalli both inclusive, from Tanjore to Nagore both inclusive, from Nidamangalam to Mannargudi both inclusive, from Trichinopoly to Erode both inclusive, from Madura junction to Tuticorin both inclusive, from Maniyachi to Tenkasi both inclusive, from Tinnevelly Junction to Tiruchendur both inclusive, from Tiruchendur to Tissianvilai both inclusive, from Virudhunagar to Tenkasi both inclusive, from Tiruvottiyur to Arambakkam both inclusive, from Villivakkam to Madukarai both inclusive, from Arkonam to Mamunduru both inclusive, from Renigunta to Akkurti both inclusive, from Renigunta to Katpadi both inclusive, from Pakala to Mulacalacheruvu both inclusive, from Walajah Road to Ranipet both inclusive, from Jalarpet to Gudupulli both inclusive, from Tirupattur to Krishnagiri both inclusive, from Morappur to Hosur both inclusive, from Salem junction to Salem town both inclusive, from Podanur to Pollachi both inclusive, and from Podanur to Kallar both inclusive.

(C)

Rules under Section 7 of the Cotton Transport Act, 1923 (III of 1923), as amended by the Cotton Transport (Amendment) Act, 1925 (XXXIV of 1925).

In exercise of the powers conferred by Section 7 of the Cotton Transport Act, 1923 (III of 1923), as amended by the Cotton Transport (Amendment) Act, 1925 (XXXIV of 1925), and in supersession of the notification No. 345, dated 18th November 1925, at pages 2245-47, Part I of the *Fort St. George Gazette*, dated 24th November 1925, the Governor acting with his Ministers is pleased to make the following rules to carry out the purposes of the said Act, namely :—

(1) *Licensing authority ; form of application for a licence.*—Licences for the import of cotton by rail and sea into the protected areas shall be granted by the Director of Agriculture, Madras Presidency, or such other officer as may be authorized by him in this behalf, and application shall be made to that officer in Form A annexed to these rules.

(2) No cotton (*kapas*, ginned cotton, or cotton waste) of which the import has been prohibited by or under Section 3 of the Cotton Transport Act, 1923, as amended by the Cotton Transport (Amendment) Act, 1925 (XXXIV of 1925), shall be imported into a prohibited area by sea save under and in accordance with the conditions of a licence issued as provided by these rules.

(3) *Licences for import of cotton for manufacture and export.*—(*i*) Annual licences for import by rail shall be granted to manufacturers and exporters carrying on business within the protected area for the importation of cotton or of any specified kind of cotton from outside such area for manufacture and export to any port or ports in or outside India provided it or they is or are not in a protected area. Such licences shall be in Form B* hereto annexed and shall be subject to the conditions stated therein.

(*ii*) A certified copy of such licences in Form C* hereto annexed shall be tendered with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for despatch to the Secretary, Indian Central Cotton Committee.

(*iii*) The licence shall be returned to the licensing authority at the expiration of the period for which it is granted together with all unused certified copies of the same.

(4) *Licence for particular consignment by rail.*—(*i*) A single licence to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, *kapas*, ginned cotton or cotton waste) into the protected area. Such licences shall be in Form D* hereto annexed and shall be subject to the conditions stated therein.

(*ii*) Such licence shall be surrendered at the station of delivery to the Stationmaster or other railway servant responsible for the receipt and delivery of goods and parcels at the time of taking delivery of the cotton covered by the licence who shall forward it to the licensing authority.

(*iii*) A certified copy of such licence in Form E* hereto annexed shall be tendered with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for despatch to the Secretary, Indian Central Cotton Committee.

(5) *Licence for particular consignment by sea.*—(*i*) A single licence to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, *kapas*, ginned cotton or cotton waste) by sea into the protected area. Such licences shall be in Form F* annexed and shall be subject to the conditions stated therein.

(*ii*) Such licence shall be delivered at the place specified by the licensing authority to the officer mentioned in the licence, who shall forward it to the licensing authority.

(6) *Separate licences to be issued for different kinds of cotton.*—Separate licences shall be issued for different kinds of cotton, that is to say, for ginned cotton, unginned cotton (*kapas*) and cotton waste.

(7) *Penalty.*—Any contravention of these rules or of the conditions of any licence granted hereunder, not otherwise punishable under the said Act, shall be punishable on conviction by a Magistrate with fine which may extend to five hundred rupees.

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* Not printed.

FORM A.

APPLICATION FOR LICENCE.

(See Rule 1)

To

The Director of Agriculture,
Madras Presidency.

Sir,

I/We the undersigned hereby beg to apply for a licence under the Cotton Transport Act, 1923 (Act III of 1923), as amended by the Cotton Transport (Amendment) Act, 1925 (XXXIV of 1925), available for the period of for the importation by rail/sea of

bales/*maunds of _____ (State whether ginned cotton, unginned cotton (*kapas*) or cotton waste)

into the protected area known as
notified in Government Notification, Development Department, No. dated
at† station from‡

for the purpose of

I/We so beg to apply for a certified copy of the licence (as required by the said Act).

2. I/We declare that such cotton/*kapas*/waste is required for the purpose of only and will not be otherwise used save under the instructions of the licensing authority.

Reasons why importation is necessary (*a*).

3. I/We undertake—

(1) in the event of the cotton/*kapas*/waste imported under the said licence proving unsuitable for the purpose for which it is imported, to report the matter to the licensing authority and to await his approval to its disposal otherwise before allowing such cotton/*kapas*/waste to leave my/our premises;

(2) that under no circumstances will I/We allow cotton/*kapas*/waste imported under the said licence to be used for mixing with, or adulteration of cotton/*kapas* produced in the protected area for re-export nor will I/we allow it to be re-exported under a misdescription;

(3) to return the said licence on expiration of the period for which it is granted to the licensing authority together with such details as he may require as to the cotton/*kapas*/waste imported under it and of its subsequent disposal.

Dated Signed

at

---

* Maund=82⅔ lbs.

† Here enter station of import.

‡ In the case of applications for single licences, the station of export should be entered here.

(*a*) Reasons should be clearly stated as licences are only issued in cases of proved necessity. In the case of applications for licences to import by sea, the form should be modified as may be necessary.

INSTRUCTIONS.

(*a*) The Cotton Transport Act does not impose any general restriction on cotton transport but only on transport into specified areas (notified by Local Governments for protection) by rail, road, river and sea or by one or more of such routes. The notifications issued by the Government of Madras prohibit transport only by rail and sea and not transport by road and river and the prohibition applies only to ginned cotton, unginned cotton (*kapas*) and cotton waste. Cotton seed is allowed to be transported freely without restriction. Each notification includes a schedule of railway stations in the protected area to which it refers. Licences are only required by concerns situated within the limits of a protected area. Licences granted under the Cotton Transport Act are available for the importation of cotton from anywhere in India but only to the stations specified. Separate licences are required for the import of each of the specified kinds of cotton, viz., ginned cotton, unginned cotton (*kapas*) and cotton waste. Separate rules are also in force for the importation of cotton by sea into the protected areas.

(*b*) Stationmasters or other railway servants responsible for the booking of goods or parcels at all stations in India are *empowered* by Section 4 of the Act to refuse to book cotton to a notified station in a protected area unless a certified copy of the licence is handed in when the cotton is tendered for booking. Each consignment requires a separate certified copy which will accompany the railway invoice to destination.

(*c*) Stationmasters or other railway servants responsible for the receipt and delivery to the consignee of goods and parcels at notified stations are *required* by Section 5 of the Act to refuse delivery of cotton from outside the protected area (which is defined by a list of stations) unless accompanied by a certified copy of the licence (or unless the original licence is produced).

(*d*) Paragraph 2 in the application form corresponds with condition (*b*) of the licence, the object being to safeguard the protected area against the misuse (which might be quite unintentional) of cotton imported under licence.

(*e*) The protected areas notified in the Madras Presidency are those contained in Government Notification, Development Department, No. dated

APPENDIX IV.

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA HOLKAR.

OFFICE OF THE INDORE LEGISTATIVE COMMITTEE.

Bill No. XIV of 1927.

A Bill to provide for the restriction and control of the transport of cotton in certain circumstances.

Preamble. Whereas it is expedient for the purpose of maintaining the quality and reputation of the Cotton grown in Holkar State; to enable the restriction and control of the transport by rail; and the import of Cotton into the State; it is hereby enacted as follows:—

Short title and extent. 1. This Act may be called the Indore Cotton Transport Act No.....of 1928;

It extends to the whole of the Holkar State; and it shall come into force at once.

Definition. 2. In this Act, unless there is anything repugnant in the subject or context:—

(*a*) " Certified Copy " in relation to a license means a copy of the license certified in the manner described in Section 76 of the Indore Evidence Act, by the Authority by which the license was granted ;

(*b*) " Cotton " means every kind of unmanufactured cotton, that is to say, ginned and unginned cotton, cotton waste and cotton seed ;

(*c*) " Cotton Waste " means droppings, strippings, fly and other waste products of a cotton mill other than yarn waste ;

(*d*) " License " means a license granted under this Act ;

(*e*) " Notified Station " means a railway station specified in a notification under Section 3 ;

(*f*) " Prescribed " means prescribed by rules made under this Act ;

(*g*) " Protected area " means an area into which the import of cotton or any kind of cotton has been prohibited wholly or partly by a notification under Section 3.

Power to issue notification prohiting import of cotton into protected area.

3. (1) The Government may, for the purpose of maintaining the quality or reputation of the cotton grown in any area in the State, by notification in the *Holkar Sirkar Gazette*, prohibit the import of cotton or of any specified kind of cotton into that area by rail save under, and in accordance with the conditions of a license ;

Provided that no such notification shall be deemed to prohibit the import into any protected area of packages containing any kind of cotton and not exceeding ten pounds avoirdupois weight.

(2) Any such notification may prohibit the delivery to, and the taking of delivery by, any person, at any specified railway station situated in the protected area, of any cotton, the import of which by rail into that area is prohibited when such cotton has been consigned from a railway station not situated in that area, unless such person holds a license for the import by rail of the cotton into that area.

Refusal to carry unlicensed cotton.

4. (1) Notwithstanding anything contained in the Indian Railway Act, 1890, or any other law for the time being in force, the station master of any railway station or any other railway servant responsible for the booking of goods or parcels at that station may refuse to receive for carriage at, or to forward or allow to be carried on the railway from, that station any cotton consigned to a notified station, being cotton of a kind of which the delivery at such notified station has been prohibited unless both stations are in the same protected area, or unless the consigner produces a certified copy of a license for the import of the cotton by rail into the protected area in which such notified station is situated.

(2) Every certified copy of a license when so produced shall be attached to the invoice or way-bill as the case may be and shall accompany the consignment to its destination, and shall there be dealt with in the prescribed manner.

(3) Where by or under any law in force in British India or in the territories of any State in India the import by rail into any area, or the delivery at any railway station, of cotton or of any kind of cotton has been prohibited, the Government may, by notification in the *Holkar Sirkar Gazette*, declare that the provision of sub-section (1) shall apply in respect of cotton consigned to any such station as if such area and such station were respectively a protected area and a notified station, and as if any license granted under such law were a license granted under this Act.

5. Where any cotton, the import of which by rail into any protected area has been prohibited has been consigned to and arrives at a notified station in any such protected area, the station master or other railway servant responsible for the receipt and delivery to the consignee of goods or parcels, as the case may be, at that station, shall, unless both the notified station and the railway station from which the cotton has been consigned are situated in the same protected area, refuse to deliver the cotton until he is satisfied that the consignee holds a license for the import of the cotton by rail into the protected area in which such notified station is situated; and, if he is not so satisfied, or if within fourteen days the consignee or some other person acting on his behalf does not appear in order to take delivery, shall return the cotton to the railway station from which it was consigned, together with an intimation that delivery of the cotton has been refused or has not been taken, as the case may be.

Procedure where cotton arrives at notified station.

6. Any person who, in contravention of the provisions of this Act or of any notification or rule made hereunder, knowingly takes delivery of any cotton from a notified station or imports, or attempts to import any cotton into a protected area shall be liable to a fine not exceeding one thousand rupees, and upon any subsequent conviction to imprisonment which may extend to three months, or to fine which may extend to five thousand rupees or to both.

Penalties.

7. (1) The Government may, by notification in the *Holkar Sirkar Gazette*, make rules to provide for any of the following matters, namely:—

Power to make rules.

(*a*) the prevention of the import into a protected area by rail, save under and in accordance with the conditions of a license of cotton the import of which into that area has been prohibited wholly or partly by a notification under Section 3;

(*b*) the terms and conditions to be contained in licenses and the authorities by which they may be granted; and

(*c*) the manner in which licenses and certified copies thereof shall be dealt with on and after the delivery of the cotton to which they relate.

(2) Any such rules may provide that any contravention thereof or of the conditions of any license not otherwise made punishable by this Act, shall be punishable with fine which may extend to Rs. 500.

8. No notification under Section 3 or rule under Section 7 shall be issued by the Department unless it has been laid in draft before the Government and has been approved by them either with or without modification or addition, but upon such approval being given the notification or rule, as the case may be, may be issued in the form in which it has been so approved.

Previous approval of Government to issue notification and rules.

9. No suit or other legal proceeding shall be instituted against any person in respect of anything which is in good faith done or intended to be done under this Act.

Protection for acts done under Act.

STATEMENT OF OBJECTS AND REASONS.

There is no Act in the Holkar State at present to restrict and control the transportation of cotton within the State. It has been brought to the notice of His Highness' Government that the Mewar cotton which is inferior to the Malwa cotton in quality is imported into the State in the form of *kapas* or ginned cotton and mixed with the real Malwa article.

With a view therefore to maintain the existing reputation of Malwa cotton it is necessary to restrict the importation of such inferior cotton by means of an enactment on the lines of the law in force in British India.

The present Bill is drafted on the basis of the British India Cotton Transport Act, No. III of 1923, with changes necessary to suit the local circumstances.

APPENDIX V.

AMENDMENTS TO THE BOMBAY COTTON GINNING AND PRESSING FACTORIES RULES, 1925.

GENERAL DEPARTMENT.

BOMBAY CASTLE, 22nd December 1927.

No. 6389-A.—In exercise of the powers conferred by Section 13 of the Cotton Ginning and Pressing Factories Act, 1925 (XII of 1925), the Governor in Council is pleased with effect from the 1st September 1928 to amend the Bombay Cotton Ginning and Pressing Factories Rules, 1925, published in Government Notification, General Department, No. 6389-A, dated the 25th August 1925, as follows, namely :—

(1) For rules 6 (2), 7 and 8 of the said rules the following rules shall be substituted, namely :—

"6. (2) On and after the first day of September 1928 no weights shall be used in any cotton ginning or cotton pressing factory unless they have been duly certified in accordance with these rules."

(3) On and after the same date any weight not so certified which is found in the possession of the owner of any cotton ginning or cotton pressing factory shall be deemed to have been used in such factory.

6A. *Certification of Weights.*—The Inspector shall only certify a weight, which—

(*a*) does not deviate from the standard weights supplied to him, in excess of the following limits :—

Denomination of weight.	*Maximum deviation permissible.*
1 lb. 2 lbs. 4 lbs.	½ tola.
7 lbs. 14 lbs. 28 lbs.	1 tola.
56 lbs.	2 tolas.
112 lbs.	4 tolas.

(*b*) does not in his opinion facilitate the perpetration of fraud,

Example.—A weight, which has a removable or split ring, shall be deemed to facilitate the perpetration of fraud.

(*c*) has the denomination of the weight clearly and indelibly marked on it,

(*d*) is free from flaws and smooth on all its surfaces,

(*e*) is provided with one adjusting hole in its under surface. The adjusting hole shall not extend to the upper surface of the weight and shall be undercut so that the lead adjustment is not removable.

Exception.—Any weight offered for certificate at the first inspection of a factory by the Inspector under these rules may have two adjusting holes.

6B. *Manner of Certification.*—A weight shall be deemed duly certified when it has been stamped on the lead adjustment by the Inspector in such a way as to cover the lead as far as possible with a monographic stamp on which the letters B O M have been incorporated.

6C. *Subsequent Test : Obliteration of Stamp.*—If on any subsequent test the Inspector shall find that any weight does not fulfil the conditions of rule 6A, he shall obliterate all the impressions on the lead adjustment of the weight and the weight shall be deemed not to have been duly certified.

7. *Certified Scales or Weighing Apparatus to be used for weighing Kapas, etc.*—(*i*) On and after the first day of September 1928, no scales or weighing apparatus shall be used in any cotton ginning or cotton pressing factory for the purpose of weighing *kapas*, ginned cotton, pressed bales or any other cotton, unless they have been duly certified by the Inspector.

(*ii*) On and after the same date, if any scales or weighing apparatus not duly certified are found in the possession of the owner of any cotton ginning or cotton pressing factory, the burden of proof that the scales or weighing apparatus has not been used for the said purpose shall lie upon the said owner.

(*iii*) All such scales and weighing apparatus shall be retested at least once a year by the Inspector.

Exception.—This rule shall not apply to a weighing machine in a cotton pressing factory for weighing loose cotton immediately prior to baling.

7A. *Stamping of Scales and Weighing Apparatus.*—The Inspector shall stamp only such scales and weighing apparatus which do not facilitate the perpetration of fraud and are sensitive and accurate.

Example.—Scales to any part of which any attachment for adjusting the balance has not been permanently fastened shall be deemed to facilitate the perpetration of fraud.

7B. *Test of Sensitiveness and Accuracy of Scales.*—For the purpose of testing the sensitiveness and accuracy of scales, the Inspector shall make the following tests, namely :—

Sensitive Test.—Scales used or intended to be used for weighing *kapas*, ginned cotton or other cotton shall be balanced and loaded with a standard weight of 56 lbs. in one of the pans.

An additional weight of 2 tolas in either pan shall be sufficient to turn the beam to an appreciable degree.

Accuracy Test.—Scales used or intended to be used for weighing *kapas*, ginned cotton or other cotton shall be tested for accuracy by balancing the beam with a standard weight of 56 lbs. in one of the pans. The beam shall then be reversed and weight of 4 tolas or less shall be sufficient to restore balance.

Sensitive Test.—Scales used or intended to be used for weighing bales or cotton shall be tested for sensitiveness by balancing the scales with a bale of cotton or its approximate equivalent of 400 lbs. in the pans. An additional weight of 10 tolas in either pan shall be sufficient to turn the beam to an appreciable degree.

Accuracy Test.—Scales used or intended to be used for weighing bales of cotton shall be tested for accuracy by balancing a cotton bale or its approximate equivalent of 400 lbs. in the pans. The beam shall then be reversed and a weight of 15 tolas or less shall be sufficient to restore balance.

7C. *Supply of Weights.*—The owner of a cotton ginning or cotton pressing factory containing a platform weighing machine or a weigh-bridge used for weighing *kapas*, ginned cotton or pressed cotton shall, in order to facilitate the testing of the apparatus, maintain in or adjacent to the factory a total supply of weights of not less than 448 lbs.

7D. *Tests on Weighing Apparatus.*—The Inspector shall make the following tests on weighing apparatus other than scales :—

(*a*) *On a Platform Weighing Machine.*—The machine shall first be tested for sensitiveness by adjusting the zero adjustment until the machine balances with no load on the platform. The platform shall then be loaded with a weight of 1 cwt. and balanced. An additional load of 10 tolas or $\frac{1}{4}$ lb. shall cause the indicating lever to move appreciably. The platform weighing machine shall then be loaded with weights of 2, 3, and 4 cwts. according to the capacity of the machine, and after balancing in each case, additional weights of 20, 30 or 40 tolas or $\frac{1}{2}$, $\frac{3}{4}$ or 1 lb., respectively, shall cause the indicating lever to move appreciably.

(*b*) The platform weighing machine, if sufficiently sensitive, shall be loaded successively with weights of 1, 2, 3 and 4 cwts. according to its capacity and balanced at each of these loads. The deviation from accuracy shall not exceed 10, 20, 30, or 40 tolas respectively, i.e., $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or 1 lb.

(*c*) *Weigh-bridges.*—The weigh-bridge shall first be tested for sensitiveness by adjusting the zero adjustment so that the machine balances with no load on the platform. It shall then be balanced with a load of 448 lbs. on the platform. An additional load of 1 lb. on the platform shall cause the scale arm to move appreciably.

(*d*) The weigh-bridge, if sufficiently sensitive, shall be tested for accuracy by loading and balancing the platform with a weight of 448 lbs. The indicated weight shall not deviate more than 1 lb. from the actual weight.

7E. *When Scales Deemed Certified.*—The Inspector shall stamp scales with a single monographic impression in which the letters B O M have been incorporated. The impression shall be made on a lead plug of at least 3/8″ diameter fitted into the scale beam immediately under or over the central knife edge. The plug shall be made irremovable by undercutting or in some other suitable manner and its surface shall be even and below the surface of the beam. The plug shall not penetrate the beam. After scales have been so stamped, they shall be deemed to have been duly certified.

7F. *When Platform Weighing Machines or Weigh-bridges Deemed Certified.*—The Inspector shall stamp platform weighing machines or weigh-bridges with a single monographic impression in which the letters B O M have been incorporated. The impression shall be made on a lead plug in a conspicuous position either on the shoulder or the opposite end of the indicating lever. The plug shall be of at least 3/8″ diameter and be made irremovable by undercutting or in some other suitable manner. Its surface shall be even and below the surface of the indicating lever. After platform weighing machines or weigh-bridges have been stamped, they shall be deemed to have been duly certified.

7G. *Subsequent Test : Obliteration of Stamp.*—If on any subsequent test the Inspector shall find that the deviation of sensitiveness or of accuracy is double of that permissible at the initial test, he shall obliterate the impression on the lead plug and the scales or weighing apparatus shall be deemed not to have been duly certified.

8. *Inspectors.*—In these rules the word "Inspector" means any person whom Government may by notification appoint for the purpose of inspecting, testing, stamping and certifying the weights and scales or weighing apparatus used or to be used in cotton ginning or cotton pressing factories.

8A. If any difference arises between the Inspector and any other person as to the meaning or construction of the rules regarding the stamping or testing of weights and scales or as to the method of testing or verifying any weight, scales or weighing apparatus, such difference shall at the request of either party (unless the Inspector be the Collector) be referred to the Collector whose decision shall be final.

8B. *Maintenance of Register.*—Every owner of a cotton ginning or cotton pressing factory shall maintain a register in which shall be entered the number, description and date of certification of every weight, scales or weighing apparatus used in the factory. The Inspector shall sign each completed entry in the register.

No. 6389/B.—The Governor in Council is pleased to appoint all Inspectors of Factories under the Indian Factories Act, 1911 (XII of 1911), to be Inspectors within the whole Presidency including Sind and all Mamlatdars, Mahalkaries, Mukhtiarkars and officers in charge of revenue sub-divisions of districts to be Inspectors within the districts in which they are serving for the purposes of rules 6A, 6B, 6C, 7(i) and (iii), 7A, 7B, 7D, 7E, 7F and 7G of the Bombay Cotton Ginning and Pressing Factories Rules, 1925.

No. 6389/C.—In exercise of the powers conferred by rules 4 and 11 of the Bombay Cotton Ginning and Pressing Factories Rules, 1925, the Governor in Council is pleased to empower :—

(*i*) all Inspectors of Factories under the Indian Factories Act, 1911 (XII of 1911), to enter and inspect the cotton ginning or cotton pressing factories situate within the Presidency including Sind, and

(*ii*) all Mamlatdars, Mahalkaries, Mukhtiarkars and officers in charge of revenue sub-divisions of districts to enter and inspect the cotton ginning and pressing factories within the districts in which they are serving.

No. 6389/D.—In exercise of the powers conferred by sub-section (*i*) of section 492 of the Code of Criminal Procedure, 1898 (V of 1898), the Governor in Council is pleased to appoint the Inspectors appointed for the purposes of the Bombay Cotton Ginning and Pressing Factories Rules, 1925, to be Public Prosecutors in their respective areas for the purpose of conducting prosecutions under the Cotton Ginning and Pressing Factories Act, 1925 (XII of 1925).

By order of the Governor in Council,

C. W. A. TURNER,
Secretary to Government.

(*Extract from the "Bombay Government Gazette," December 29, 1927.—Part I, pp.* 3017-3019.)

APPENDIX VI.

COMPARATIVE STATEMENT SHOWING THE PERMISSIBLE ERRORS IN WEIGHTS, AND THE DEGREES OF SENSITIVITY AND ACCURACY IN BALANCES IN MADRAS AND BOMBAY.

		Bombay. Maximum error allowed.		Madras. Maximum error allowed.		Remarks.
		Sensitiveness.	Accuracy.	Sensitiveness.	Accuracy.	
Weights.	lbs. 1		½ tola = 87½ grains.		12 grains	In the case of weights Madras allows only half the error in deficiency.
	,, 2				24 ,,	
	,, 4				36 ,,	
	,, 7		1 tola = 175 grains.		48 ,,	
	,, 14				72 ,,	
	,, 28				120 ,,	
	,, 56		2 tolas = 350 grains.		180 ,,	
	,, 112		4 tolas = 700 grains.		360 ,,	
Scales.—(Beam).						
	lbs. 56	2 tolas = 350 grains.	4 tolas = 700 grains.	75 grains.	120 ,,	
	,, 400	10 tolas.	15 tolas.	No equivalent.		For scales used for weighing bales.
	,, 224	No equivalent.		7·5 drams = 205 grains.	10.5 drams = 287 grains.	For every additional 1 cwt. 1.5 drams and 3 drams respectively. (1.5 drams = 41 grains. 3 drams = 82 grains.)
Weighing Apparatus. Platform type. (accelerating).						
	Cwt. 1	¼ lb.	¼ lb.	1 oz.	2 ozs.	
	,, 2	½ ,,	½ ,,	No equivalent.		
	,, 3	¾ ,,	¾ ,,	2 ozs.	4 ozs.	
	,, 4	1 ,,	1 ,,	No equivalent.		
Weigh-bridge. (accelerating).						
	lbs. 448	1 lb.	lb.	No equivalent.		
	ton 1	No equivalent.		1½ lbs.	4 lbs.	

APPENDIX VII.

DRAFT RULES FOR THE ESTABLISHMENT OF A COTTON MARKET AT PARBHANI.

1. There shall be a Cotton Market at Parbhani which shall be managed as described below.

2. The market shall be controlled by a managing committee which shall consist of an officer appointed by Government as chairman, three representatives of cotton buyers and dealers and five representatives of cotton growers, of whom not more than three shall sit on the committee at any one time. The members of the Committee shall be nominated by Government on the recommendation of the Director-General of Commerce and Industry.

3. The Committee shall have control over the Cotton Market as follows :—

(*a*) *The Market Yard*, i.e., the enclosure bounded by a wall, known as the " Cotton Market Yard," shall be under the absolute control of the Committee, subject to such powers of supervision as may be given to the First Talukdar and the Director-General of Commerce and Industry ;

(*b*) In the *Market Proper*, which will include all lands within three miles of the Cotton Market including all ginning and pressing factories and their compounds, the Committee shall exercise such powers only as may be necessary for the proper control of all dealings in and weighments of unginned cotton and for the supervision of cotton carts and for the enforcement of the market rules and by-laws.

4. No person shall establish or deal in any market within five miles of the market yard. This will not prevent any cultivator selling his cotton in his own village.

5. No one except a cotton grower may buy or deal in cotton within the market, unless he has obtained a license from the Committee. Such license shall be renewed annually.

6. Any person may be licensed as a buyer or broker on making a written application and agreeing to conform to such rules as may be prescribed from time to time by the Market Committee, and on paying a fee of Rs. 10 per annum,

7. All weighments and measurements of unginned cotton shall be carried out either in the market area or in the compound of some ginning factory within the market area and shall be under the control of the Market Committee, or such agents as they may employ for the purpose.

8. No weights or scales may be used in the market yard or the market proper except such as have been prescribed and approved by the Committee.

9. In making weighments, no allowances or deductions may be made except those included in the list sanctioned by the Market Committee and exhibited in a conspicuous place in the market yard.

10. A list of these allowances duly authenticated shall be hung up in the compound of every ginning factory.

11. The auctioning of the unginned cotton and the fixing of the daily rate or rates shall be effected in accordance with by-laws to be made by the Cotton Committee and the daily rate or rates when fixed shall be exhibited in a conspicuous place in the market yard.

12. Any dispute between a buyer and seller of unginned cotton or their agents regarding the quality or weight of the cotton, the price or rate to be paid, the allowances for wrappings, dirt or impurities or deductions for any cause, shall be referred to the Cotton Committee or to arbitrators appointed by them and the decision of the Committee or the arbitrators shall be final.

13. The Market Committee may appoint or employ such officers and servants as may be necessary for the efficient management of the market and may assign to such officers and servants such salaries as it thinks fit.

14. All weighments of unginned cotton shall be made by persons licensed by the Cotton Committee who shall receive such fees from buyers and sellers as may be prescribed by the Committee. Such licenses shall be renewable annually on payment of the fee prescribed by the Committee.

15. (*a*) The Committee may cancel the license of any person registered as a buyer or broker who violates the conditions of his agreement but an appeal will lie to the Director-General of Commerce and Industry Department against any such decision.

(*b*) The Committee may cancel the license of any weighman for reasons to be recorded in writing.

16. No buyer or broker or weighman whose license has been cancelled may have access to the cotton market yard or the compound of any ginning factory.

17. The Committee shall maintain lists of licensed buyers and brokers and of licensed weighmen. Copies of these lists shall be exhibited on the market notice-board under the signature of the chairman. Notices of cancellation of any license shall be exhibited in the same way. Any person dealing with or employing any unlicensed buyer, broker or weighman within the Market Proper shall himself be liable after due warning to be warned off the Cotton Market Yard and to have his own license cancelled.

18. The fees payable to licensed brokers shall be fixed by the Market Committee.

19. All weights and scales shall be open to inspection at all times by the Committee or their agents.

20. The Committee shall have power to warn off any unlicensed person or any person using unauthorised or incorrect weights and scales from the Cotton Market Yard, and thereupon no licensed broker or weighman may have any dealings with him or any factory which he owns or in which he is employed.

21. The Committee may frame by-laws for the carrying out of its duties.

22. The Chairman shall be responsible that proper records are maintained and shall conduct all correspondence in the name of the Committee. He shall be responsible for the keeping of accounts, for the punctual rendering of all reports and accounts and for the custody of all monies not deposited in the Treasury.

23. He shall have a casting vote in addition to his ordinary vote, and shall keep a minute book of all proceedings over the signature of the Chairman.

24. There shall be a fund called the " Parbhani Cotton Market Fund " into which all receipts of the Committee shall be paid.

25. There shall be levied on every cart laden with unginned cotton a fee of one anna which shall be placed to the credit of the Cotton Market Fund.

26. Half the net annual surplus of the Cotton Market Fund shall be paid to the Local Funds Department.

27. All money received by or for the Committee shall be paid into the Treasury on the same day, save for an imprest advance of Rs. 100 which shall be in the custody of such person as the Chairman may direct. The Chairman shall draw by cheque such money as may be required by the Committee.

28. The Committee shall keep such accounts as may be prescribed by the Director-General of Commerce and Industry and shall prepare a budget annually which shall be submitted to the Director-General for approval by September the 15th each year. The accounts of the fund shall be audited annually under the orders of Government.

29. The Committee shall exercise all their powers subject to the general control of the Director-General of Commerce and Industry and in particular no by-law shall be prescribed, no fee levied, no weights or scales approved, no conditions of any license made or altered, no officers employed or scales of pay fixed and no allowances or deductions approved without his previous sanction.

APPENDIX VIII.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract.*—The policy of the Agricultural Department to establish 1027 A.L.F. in the whole of the South Narbada tract remained the same. The Rajpipla State has taken up the question more seriously and purchased more than the required quantity of seed for distribution amongst its ryots, so that there might not be the slightest chance of growing inferior quality of cotton. The territory of Chhota Udepur towards the north of the Narbada in Rewa Kantha Agency will be again wholly sown with 1027 A.L.F. seed purchased from the Agricultural Department because the crop grown from this seed had a ready market and realised better prices in comparison with the neighbouring Dabhoi (Gaekwar Territory) cotton.

The Agricultural Department controlled 11,856 acres of private seed farms and 2,938 bales of cotton were produced. This was sold in the open market at a premium varying from Rs. 11 in the beginning of the season to Rs. 35 per *candy* in the busy season.

The figures of acreage and production from the seed issued by the Department may be taken at about 250,000 acres in all and an estimate of about 62,500 bales.

The demand for the improved seed is increasing and over 2½ millions pounds have been distributed this year.

(2) *The Dholleras Tract.*—The experience of the last six seasons emphasised the difficulty of rapidly expanding the area under improved types of cotton in this tract owing to the uncertainty of the climatic conditions; the rainfall at times is precarious and at other times too heavy for a good stand of plants. The policy of the Department is to distribute seed of the two improved strains of Wagad cotton (Nos. 4 & 8) around Bavla of the Dholka Taluka and around Viramgam. The quantities of seed issued during 1927-28 were 10,000 lbs. (6,200 lbs. of Wagad 4 and 3,800 lbs. of Wagad 8) covering about 700 acres (450 acres of Wagad 4 and 250 acres of Wagad 8) but there was unprecedented heavy rain during the last week of July 1927 (38½ inches) which hopelessly spoiled all the crop. The actual areas remaining under these two types were 154½ acres of Wagad 4 and 5 acres of Wagad 8. About 14,000 lbs. of seed of Wagad 4 have been obtained for distribution in the season 1928-29, which will be sufficient for about 800 acres. Seed of Wagad 8 could not be secured as the crop of 5 acres was not kept pure to the desirable standard by the owner. However, there will be 20 acres under this type during the season 1928-29 from the seed multiplied on the Viramgam Breeding Station. The premium realised by merchants who purchased *Kalas* (Cotton Bolls) amounted to Rs. 15 per *candy* of lint.

(3) *The Kumpta-Dharwar Tract.*—The cultivation of selected types of Kumpta and Dharwar-American varieties, known respectively as Selected Kumpta (Dharwar I) and Upland (Gadag I), continued to extend round Hubli and Gadag. The cotton staff of the Agricultural Department and the Cotton Sale Societies of Hubli and Gadag continued to work together. According to the seed multiplication scheme laid down by the Agricultural Department, a block of 7,900 acres was under selected Kumpta and one of 8,815 acres under Upland cottons in a few villages round Hubli and Gadag respectively. The estimated yield from each of these two blocks was 2,000 bales. Small seed multiplication blocks of 100 acres each were started during the year in Bijapur and Bagalkot areas also. As usual, seed depots were started in various suitable centres for distribution of pedigree seed stocked by the Cotton Sale Societies. Owing to the unfavourable season the crop was below normal. In Bijapur and Bagalkot areas special attempts were again made by the Agricultural Department to distribute selected Kumpta cotton seed as the Sale Societies are not yet able to take up this work. Seed sufficient for 20,000 acres was distributed in these two centres. The season for cotton was again very unfavourable and yields were very low in Bijapur District. The total area under Selected Kumpta seed was 177,800 acres against 300,000 acres last year, and under Upland 102,000 acres against 125,000 last year. The total estimated yields were 24,100 and 15,700 bales respectively.

The new cross (Dharwar No. 1 × Rosea) was grown on an area of 1,800 acres round Bailhongal. The produce was sold at special auction sales and a premium of Rs. 25 per *naga* (1,344 lbs. *kapas*) over Kumpta was realised. The seed has been purchased by the Bailhongal Cotton Sale Society and amounts to 110,000 lbs., sufficient for 12,000 acres. This new cross is appreciated in Bailhongal Taluka and Murgod Mahal of the Belgaum District and is likely to spread.

(4) *The Khandesh Tract.*—Extensive trials were given during the year to the two promising strains, Dhulia 1 (BXX-27) and Dhulia 2 (BXI-934) in comparison with N.R. in order to obtain reliable figures of yield. Both strip tests and field scale trials were adopted. The results show that, as far as the 1927-28 season is concerned, Dhulia 1 was slightly superior to N.R. in yield. This strain was grown in four villages in different talukas of Khandesh District in nearly 600 acres and yielded an average of 369 lbs. an acre.

Pure Roseum (N.R.) cotton seed for about 20,000 acres was distributed through Taluka Development Associations, Co-operative Banks, etc. In addition to this a large quantity of N.R. seed was also distributed by cultivators themselves.

MADRAS.—I. *Tiruppur Cambodia Area.*—(*a*) *Cambodia.*—(*i*) The work of improvement of Cambodia cotton began in 1918-19. The Agricultural Department usually enters into yearly contracts with selected ryots and advances to them money at the rate of about Rs. 15 per acre towards the cost of inter-cultivation operations. The ryots in turn sow the seed supplied by the Department on " Seed Farms " under its supervision. The entire *kapas* produced is ginned co-operatively and the seed is bought by the Department at a premium of Rs. 2 per *pothi* of 250 lbs. and the lint is sold by the Department in public auction on behalf of the cultivators. The advantages of the system are :—

(i) The supply of pure seed of a recognised strain obtains for the ' ryot ' a higher yield of *kapas* ;

(ii) the supply of capital for cultivation expenses enables the grower to free himself from the clutches of money-lenders who are themselves traders, and also enables the grower to dispose of the produce himself at the highest market rate ;

(iii) the joint ginning and marketing on a co-operative basis under the supervision of the Department ensure the purity of the strains and production of the best quality of lint that is in great demand by millowners. That the lint produced is of the best quality has been testified by the keen competition at the auction sales and by the high prices paid by Bombay and other mills, which fetched for the seed-farm cultivators a profit of Rs. 10 to Rs. 13 per *candy* over the market price for other lints.

(*ii*) 375,623 lbs. of seed were available for distribution among the growers of cotton for further production—364,373 lbs. having been purchased from the owners of seed farms, and 11,050 lbs. from one ryot who grew the departmental strain, and 200 lbs. of strains Nos. 295 and 440 having been supplied by the Cotton Specialist, Coimbatore. Of the quantity available 359,988 lbs. or 95 per cent. were actually distributed among the ryots in the Coimbatore District. This quantity includes 25,125 lbs. of strain No. 295 used in the seed farm area of 1,005 acres selected for the season of 1927-28. It may be noted that there was an increase of 43,135 lbs. of seed over the quantity distributed in 1926-27. The area under the improved strains during the year 1927-28 correspondingly rose by 1,803 acres over the area of last year, viz., 14,250 acres. The 'ryots' working the seed farms above referred to have grouped themselves into eight unions in the Tiruppur and Avanashi cotton area, and the registry of the unions under the Co-operative Societies Act is under contemplation.

(*iii*) The strain No. 440 above referred to was issued in 1927-28 for the first time for experiment on 'seed farms.' It has been proved to be a vigorous and high-yielding variety and it is expected that it will occupy an increased area during the coming year and will ultimately displace Co. 1 (Co. 295) in the Avanashi and Tiruppur tracts.

(*iv*) In the Trichinopoly District also, 33,830 lbs. of Cambodia sufficient to sow 3,383 acres—made up of 10,500 lbs. supplied by the Department and 23,330 lbs. supplied by a zamindar and a proprietor of a ginning factory—were distributed against 50,000 lbs. to sow 5,000 acres in the year 1926-27.

(*v*) The season was not very favourable for the crop and seed farms yielded on the average 500 lbs. of *kapas* per acre under first picking.

(*b*) *Karunganni.*—Karunganni cotton is making headway in the dry lands of Coimbatore District and is displacing dry-land Cambodia and Uppam. This strain also is being propagated in seed-farm areas under contracts with selected ryots as in the case of Cambodia, except that the advance money for inter-cultivation is Rs. 10 per acre (or Rs. 5 less than that for Cambodia). 112,250 lbs. of seed were available from the seed farms of 1926-27 and 100 lbs. of strain No. 54 were supplied by the Cotton Specialist. But only 107,018 lbs. could be distributed among cultivators for sowing in 8,900 acres, including 11,904 lbs. used for seed farms of 850 acres, against 95,379 lbs. for 7,700 acres in 1926-27. It may be noted that the quantity of seed distributed and the area cultivated have shown an increase as compared with 1926-27. An average yield of 300 lbs. *kapas* per acre was obtained. The advantages of seed farms, referred to under Cambodia, apply to Karunganni also, and the cultivators realised a premium of Rs. 8 per *candy* of lint over the prevailing market rate, in addition to the extra sum of Rs. 2 per *pothi* of 260 lbs. allowed by the Department for the seed purchased from them. In the year under review seed farms were concentrated in the Udumalpet centre as experience has shown that it is a better tract for Karunganni than either Coimbatore or Palladam.

II. *Tinnevelly Area.*—The methods adopted for the propagation of the improved strain of Karunganni, known as Company cotton, were continued as in the previous years, viz., the rapid multiplication of the seed on seed farms and production and sale of lint through agencies like Seed Unions and Co-operative Societies, without the intervention of the Agricultural Department. The seed farms were concentrated round about Koilpatti in the previous year but they were found to be uneconomical in working on account of the heavy transport charges involved and for want of natural facilities to try the different strains of cotton in the same area. Consequently, the seed farms were located in the year under review in six sub-circles over an area of 780 acres as against one sub-circle covering an area of 429 acres in the previous year. The two selected strains C. 7 and A. 10 were multiplied on these farms and they were eagerly taken up by the ryots on account of their quality and high ginning percentage. 73,655 lbs. of seed were obtained from the seed farms and 8,729 lbs. of seed were supplied by the Cotton Breeding Station, Koilpatti. Of this quantity, 8,219 lbs. were sown in seed-farm areas and 72,289 lbs. were sold to the ryots outside these areas for sowing. Besides, two Seed Unions sold to ryots independently 38,098 lbs. of seed for sowing. The total area under the two strains referred to above is estimated to be about 16,816 acres and the total yield is reckoned at 3,445,500 lbs. of *kapas* or 210 lbs. per acre.

III. *Northerns and Westerns.*—In view of the failure of the cotton crop last year owing to drought sufficient quantity of pure seed could not be obtained for sowing. The Government sanctioned a special grant of Rs. 30,500 for the purchase of pure seed from outside for sale to poor ryots on six months' credit. Kumpta seed was purchased by the Department as being the nearest to H. 25 cotton and 378,750 lbs., sufficient to sow 40,000 acres, were distributed among the ryots for sowing. The season has been bad and the yields will therefore be low.

(*a*) *Northerns Tract.*—N. 14 is the important strain for the locality. It is, however, not suited to the stiff black soils specially when the rainfall is anything less than 30 inches. It is suitable for red and mixed soils. It was grown on 2,700 acres under seed-farm conditions with the seed supplied by the Department. The total quantity of this seed distributed for sowing was 89,402 lbs. against 119,280 lbs. in the previous year. The total area under this cotton was 11,000 acres or 6,730 acres less than the area brought under cultivation in the previous year, viz., 17,730 acres. The estimated yield is about 576 lbs. per acre. Till 1924, a premium of not less than Rs. 50 per *candy* of 500 lbs. lint over the local market rate for the best Northerns was offered but the premium was reduced gradually year after year till it fell to Rs. 25 in the previous year. In the year 1927-28 the crop fetched a premium ranging from Rs. 20 to Rs. 35 and there has been an offer of Rs. 40 for this year's crop from Messrs. Binny & Co. This rise of premium if continued will encourage the ryots to increase the area in future years.

(*b*) *Westerns Tract.—H.* 62 (*H. 1*).—This is a new strain which has been evolved by the Department in the Hagari Experiment Station in the Bellary District. After exhaustive tests spread over seven years it has been proved to be more remunerative than H. 25 by at least 15 per cent. and is equal to it in the quality of lint. It has now been extended over 6,453 acres in Bellary and Anantapur districts. 175 bales of lint were sold at auction and fetched Rs. 255-6-8 per *candy* when the local market rate was Rs. 231-10-8. The variety may spread very rapidly in this tract.

H. 25.—This variety was grown in 129,452 acres in Bellary, Anantapur and Kurnool districts against 157,686 acres in the previous year. The decrease in area was primarily due to the shortage of seed. The estimated production in the seed farms was 493 lbs. per acre and in ryots' fields was only 329 lbs. per acre. The seed-farm lint was sold at a premium of Rs. 20 per *candy* of 500 lbs. over the local market rate.

The chief exporting firms continue to sell on types prepared by their own admixture of different varieties (high and low) as the outcome of trade competition and this practice continues to act as a brake on the improvement of cotton in the tract. The quality of cotton is bound to improve much more quickly if the exporting firms could be induced to sell the commodity pure and to advertise the local names of cotton instead of their type numbers. The ryots would then learn to grow the best variety of cotton and to market it pure for sale.

UNITED PROVINCES.—The introduction of improved varieties of cotton in these provinces continues to make satisfactory progress. The distribution of A.19 is being continued on the lines of previous years and the area is expanding rapidly. The demand for seed this year was far in excess of the supply available. Indents are now received from all parts of the United Provinces. This cotton has also done well in Rajputana and the area there is increasing rapidly.

As white-flowered cotton is a favourite strain with the cultivators on account of its high yielding and high ginning qualities, a new white-flowered type called C. 520 has also been isolated by the Assistant Economic Botanist during the last few years. It is under trial at the various Government Farms in small areas. At one of the farms in the Central Circle it has done better than existing forms in outturn per acre. The spinning qualities as tested and reported by the Director, Technological Research Laboratory, Bombay, are found suitable for spinning 10-12 counts.

CENTRAL PROVINCES AND BERAR.—Roseum cotton is still grown on a large scale but as a pure crop it is doubtful if its acreage is on the increase. Owing to the susceptibility of this type to wilt disease cultivators prefer a proportion at least of the yellow-flowered types which have a longer staple. The new Verum cotton, seed of which is being distributed from the Akola Farm, has rapidly come into favour. It is highly resistant to wilt disease, a good yielder and has a lint capable of spinning standard warp yarn of 20 counts. Seed sufficient to sow five thousand acres during the current season was grown in the previous year.

PUNJAB.—The Punjab-American cotton crop in the year 1927-28 suffered considerably rom climatic and other causes. Dry-hot winds and shortage of water-supply were mportant factors, but attacks of jassids, boll worm, locusts, etc., contributed. The crop on good soils with adequate water-supply was, however, reported to have given fair yields, as also were the fields which were protected by hedges or high crops.

2. The total area under American cotton was, as reported in the final forecast, 757,700 acres as compared with 1,134,600 acres in the preceding year. Of this area 4F represented 754,000 acres.

The 285F variety—a later selection—has not gained in popularity. It was grown only on a small area, whilst 289F—the other later selection—was reported to have been grown on a little more than 3,000 acres.

3. Work on indigenous cottons has been continued and the area under the *G. indicum* variety Mollisoni selection in 1927-28 was 266,000 acres which represents a considerable increase over the figures of the previous year. This is mainly due to American cottons having suffered climatically, and to their prices having been adversely affected through the nefarious practice of mixing them with *desi* varieties. The area under *G. neglectum* variety Roseum selection of *desi* cotton, which is grown in the South-east Punjab, is reported to be slightly less than that in the year 1926-27. This fall in area is due mainly to a fall in prices from those of the previous year. The total area under *desi* cotton for the year 1927-28 was 1,090,300 acres, as compared with 1,385,400 acres in 1926-27.

4. The higher prices prevailing for cotton in 1927-28 have led to some increase n the area of cotton (both American and *desi* varieties) sown in the present year (1928-29).

BURMA.—In the season 1927-28 there were 4,600 acres under improved Wagale. Distribution was commenced with the re-selected strain C. 19, which has proved to be the best yielding pure line strain produced at Mahlaing, with a ginning outturn of 36.48%.

Work is in progress with a large series of hybrid strains some of which give promise of combining a better staple with the hardiness, short life period, and high ginning percentage of Wagale.

In the West Central Circle the cotton crop has been the smallest for some years, the outturn handled by mills being less than half that of the previous year. The low prices of the previous season reacted as usual in reducing the acreage sown and yields from this were further reduced by an unfavourable season.

Varieties introduced by the Department suffered with the rest. The area under Cambodia fell from 1,500 acres to less than 1,000 acres. This is the only cotton which is being multiplied up by us for distribution.

On the Allanmyo Farm tests continued with Cambodia (Co. 1) have again shown it to be the best of the American Upland cottons yet tried in this tract. It is, however, being taken up very slowly by cultivators.

On the Allanmyo Farm white-flowered Wagale has shown itself a better yielder than the indigenous Wagyi, repeating the result obtained in the previous year.

Selections both from Wagale and from Wagyi are being made. A Wagyi-Wagale cross from Mahlaing is also under trial.

HYDERABAD STATE.—A Cotton Transport Ordinance was promulgated last year which prohibited the import of inferior cotton into a protected area (See page 14).

This area, it is hoped, will revert to the growing of Gaorani cotton, and when more pure seed becomes available, a further area will be protected. The Nizam's Government distributed on taccavi loan without interest 2,400,000 lbs. of Gaorani seed sufficient to sow 130,000 acres. Auction sales of Gaorani *kapas* were organised and premia up to Rs. 3 a *candy* of 480 lbs. of *kapas* were obtained. The State Agricultural Department has recently been reorganised and strengthened and considerable attention is now being paid to cotton work.

BARODA STATE.—Pure seed of 1027 variety to the extent of 152,400 lbs. was issued. A point worth recording in this connection was the fact that quite a large part of it was taken by Societies and by Cotton Sale Societies.

Out of nine Societies organised for joint cotton sale, five did business of 1380 *bhars* of cotton, giving a nett increase in profit of Rs. 7,554-13-0 for 276 members and the total business handled came to over two lacs of rupees.

It is a direction holding much promise for the future if properly guided and helped by the trade.

In the Broach tract trial of 9′ cotton has given promising results.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 A.L.F.) as a pure crop throughout the State. No other variety is now grown in the State and purity is maintained by the annual distribution of selected seed obtained by special arrangement from the Bombay Department of Agriculture, by the Cotton Transport Act and by control of the ginning and pressing factories. As a result Rajpipla cotton is now recognised as equal to the very best type of Surat cotton and is much sought after.

APPENDIX IX.

EXTRACTS FROM REVIEWS:

"Manchester Guardian Commercial," dated December 1st, 1927.

SPINNING VALUE OF STANDARD INDIAN COTTONS.

THE issue of Bulletin No. 7 of the Indian Central Cotton Committee* contains much information concerning the principal Indian cottons which will be of interest not only to scientific and research workers but also to spinners engaged in the manufacture of yarn from cottons of such type.

* * * * * *

Appended is a summary of the test results for the standard Indian cottons of the past season. Wherever possible full comparison is made in the Bulletin of results during the past three seasons in any one case, while explanation is also given for any discrepancies and differences of results derived during those seasons. The information presented in the various tables should prove of immense utility and assistance to spinners, not only in the working of such types of cottons, but also in their selection and purchase.

* * * * * *

* "Technological Reports on Standard Indian Cotton 1923-1926." A. James Turner Bombay: Indian Central Cotton Committee.

"The Textile Recorder," August 15th, 1927.—(Page 38)

COTTON TESTING AT THE BASE.

Both in the United States and India, spinning tests are being conducted at the base, as it were. Similar tests are being carried out in Oldham mills for the Empire Cotton Growing Corporation, and a mass of useful information is being built up. We are firmly of opinion that such a technological laboratory as that established at Matunga, Bombay, can provide most useful and helpful information to cotton growers. Provided the advice given is followed out, we should have a better quality of cotton production. It is possible to make these tests with 10-lb. weight of cotton, and therefore the number has been materially increased. The report recently issued by the Laboratory, of which Mr. A. James Turner, M.A., B.Sc., late Professor of Textile Technology at Manchester, is the head, is remarkably complete, and demonstrates the very considerable amount of work that has been accomplished. The reports on individual cottons are very full and illuminative. As we stated earlier, the work being done is of great and lasting value.

"Nature," March 3, 1928.

TEXTILE PROPERTIES OF INDIAN COTTONS.

Progress in research work on the textile properties of standard Indian cottons is reported by A. J. Turner in *Bulletin* 11, issued by the Technological Laboratory of the Indian Central Cotton Committee. The foundation of the work lies in the annual testing of the fibre characteristics and spinning properties of some eighteen pure strains, the objects being generally, to accumulate data for the investigation of the methods of determining the intrinsic value of a cotton, and specifically: (1) to prepare a series of standards by which to judge other cottons, particularly new cottons produced by cotton breeders; (2) to determine the extent to which these standard cottons are affected by seasonal variations; (3) to determine the minimum weight on which a spinning test can be carried out satisfactorily; and (4) to assist in the marketing of these cottons by providing the cotton trade with detailed information concerning them. These objects have been achieved by submitting, year by year, typical samples of each variety to spinning tests which, though carried out on full-size machines, require only small quantities of material. The significance of small-scale tests has been investigated in accordance with object (3) above, and it has been shown that trustworthy results can be obtained by spinning duplicate lots weighing 5 lbs. each. In addition, efforts have been made to determine the relationship between the physical properties of the fibres with spinning value, and while no conclusions of a positive character have been arrived at, the way seems to have been cleared for a more definite attack. Among the supplementary problems that have arisen in the course of work are those of the effect of temperature and humidity on cotton spinning, and the effect of subjecting cotton to repeated blowroom treatment. These are the subjects of *Bulletin* 9 and *Bulletin* 10 respectively. The latter has perhaps more of a technical than a general scientific appeal, but the former is interesting inasmuch as it embraces a very lucid resume and criticism of previous work on the subject, and shows that Lancashire is by no means unique in the suitability of its climate for the manufacture of cotton goods.

"The National Association of Cotton Manufacturers," U.S.A., Bulletin No. 100, *August* 1928, *page* 3.

BALANCED AND UNBALANCED DRAFTS.

It is commonly believed that balanced drafts are necessary in the preparatory processes before spinning to produce good yarn in the spinning room. The Indian Technological Laboratory in Bombay has recently published results which indicate that within reasonable limits it is unnecessary to completely reorganize a layout in order to produce satisfactorily a yarn which perhaps might appear slightly out of range of an existing organisation. Considerable time and expense may be saved by a mill if it is found that higher or lower counts may be spun from an organisation originally intended for some other count.

The results of the laboratory tests show that the difference in the system of drafting makes no practical difference in the strength, evenness or neppiness of the resulting yarn. End breakage during spinning was normal in both cases.

Eight varieties of cotton were used in the test so that the results would not reflect the behaviour of a particular kind of cotton. Two lots of each variety were run ; one on the balanced system of drafting and the other on the unbalanced. Each test was run in duplicate to insure against errors. The yarn was spun into No. 20's, No. 30's and No. 40's.

The following drafts were used for the balanced and unbalanced organisations :—

	Slubber.		Intermediate.		Fine.		Spinning.	
	Unbal.	Bal.	Unbal.	Bal.	Unbal.	Bal.	Unbal.	Bal.
20's	3.84	3.83	4.27	4.10	5.04	4.61	4.53	5.32
30's	3.86	3.93	4.30	4.42	5.10	5.19	6.64	6.22
40's	3.88	4.12	4.33	4.76	5.17	5.36	8.62	6.95

All spinning was done from single hank roving. In the unbalanced organisation it was necessary to spin No. 20's yarn with a draft of 4.53, No. 30's for which the organisation was best suited required 6.64 draft and No. 40's a draft of 8.62. Each of these numbers therefore was spun from a hank roving of approximately 5.10.

The balanced drafting where each number to be spun was produced on a separate organisation varied from a 5.32 draft for No. 20's, 6.22 for No. 30's to 6.95 for No. 40's yarn. Here there is produced identical numbers on two separate systems, one requiring constant changing of gears on processes previous to spinning and the other requiring only changes in the spinning. The yarns produced by these processes were tested and compared.

The results of these laboratory tests would indicate that it would be possible for mills to obtain higher or lower counts merely by changing the ring frame when it is occasionally necessary to spin counts higher or lower than customary but where it is not worth while to lay down a separate organisation. A great deal of time can be saved by not making any changes in the preparatory machinery for the change of counts .

" The Journal of the Textile Institute," Vol. XVIII 1927 *No.* 10, *October* 1927—*Reviews*—*Page* 213.

" Technological Reports on Standard Indian Cottons, 1923-26."—By A. J. Turner. Published by the Indian Central Cotton Committee as Bulletin No. 7, 1927.

This publication is one which can be strongly recommended to the notice of all spinners. To those using Indian cottons it gives directly interesting data as to the intrinsic values of those pure strain types that are now being propagated on a commercial scale; for those who already carry out small scale tests in their own mills it provides valuable information as to proven methods of procedure and analysis of results ; and to those who do not believe in the value of such tests it presents a very convincing argument in their favour. There are still many in the industry who assert that a small scale spinning test is incapable of giving results that are comparable with those of bulk spinning, and will rely on nothing less than a 100-lb. test. To them Mr. Turner has succeeded in giving a convincing and final answer, even in respect of card-room waste losses. As a result of his tests, he has arrived at a factor for Indian cottons by means of which a very close approximation can be made to bulk waste percentage based on the figures obtained from duplicate 10 lb. tests. While this factor, the need for which arises almost entirely out of the differential loading of the card cylinders, may not necessarily apply to other cottons, nevertheless the appropriate one is evidently simple to determine ; and in any case it is shown that provided a control sample of known wastiness is tested at the same time, the results are consistently reliable. With regard to the technique of passing the samples through the scutcher, reference is made to the difficulties presented by the relative thinness of the two ends of the lap, which cannot be used in the preparation for the final spinning. In the case of 10-lb. samples, it is reported that, prior to the finishers scutching, " four separate laps are made direct . . . then unrolled one above the other on the scutcher lattice

and again passed through the scutcher." One wonders why the simpler method of quadrupling a single lap is not used, since, if anything, this method increases the amount of material available for the final spinning. The actual results of the tests on 18 varieties of cotton are set out in a comprehensive but easily accessible way, and provide valuable information as to the relative values of the different types and as to the variation in any one type from year to year. The work was started in 1923, so that for eight of the varieties the results of tests on three successive crops are available. Mr. Turner has every reason to be proud of his achievements in those three years, and is certainly to be congratulated on the cautious and lucidly expressed preamble to his report.

No. 12—December 1927—Page 263.

The Effect of Temperature and Humidity on Cotton Spinning, with Particular Reference to Conditions in Bombay. By A. J. Turner. Bulletin No. 9, Indian Central Cotton Committee, August 1927.

The publication of this Bulletin brings us a distinct step towards the true appreciation of the position as regards the natural advantages which Lancashire possesses for cotton spinning compared with other countries. In the introduction, the author, discussing the value of previous work on the subject, emphasises the error, in experimental work of this kind, of attaching undue importance to small differences in results, and points out that comparison of yarns before conditioning is apt to lead to wrong conclusions, since that process tends to level up the differences in yarn properties which may have been caused in the first place by varying spinning conditions. The conclusions arrived at are based on careful and adequate tests on seven varieties of Indian cotton, and, while the reservation is made (p. 19) that they " can only be applied to the range of counts within which these cottons have been spun (up to 40's), to the particular range of conditions under which the cottons have been spun, and to the particular method of spinning (ring spinning)," they are worth quoting here *in extenso*.

* * * * * * * * * *

(Here are given the various conclusions.)

(6) That Bombay conditions are practically ideal for the processing of the material in cotton spinning.

The last of these (conclusions) is especially worthy of note, as is also the author's reasoning, given on p. 22, in arriving at this conclusion, in spite of Sir Benjamin Dobson's conclusion to the contrary.

" The Journal of the Textile Institute," Vol. XIX, No. 2, February 1928—Page 28.

The Effect of Subjecting Cotton to Repeated Blow-Room Treatment. Indian Central Cotton Committee Technological Laboratory Bulletin No. 10. By A. J. Turner, M.A., B.Sc.

The chief value of the work described in this Bulletin lies in the conclusion that " once cotton containing foreign matter is pressed into bale form it may be very difficult, if not impossible, to remove the foreign matter completely—especially if it consists of fragments of seed-coat—so that the appearance and value of the yarn suffer accordingly," and that therefore " the cotton trade should offer every encouragement to the movement for securing cleaner cotton." Based on the results of tests carried out on three different Indian cottons under varying conditions of blowing-room treatment, it is pointed out that whilst as many as five passages through the Crighton opener, or, alternatively, five passages through the scutcher, do not react detrimentally on the quality of the ultimate yarn, they can only effect a further removal of foreign matter to the extent of some three-quarters per cent. of the original material. It would be interesting to know what is the net amount of world wealth lost annually through the combined wastage of quality, and of effort expended on cleaning badly ginned and unnecessarily dirty cotton.

"The Journal of the Textile Institute," Vol. XIX, No. 3, of March 1928—Page 53.

Technological Reports on Standard Indian Cottons, 1927. Bulletin II, Technological Series No. 6. A. James Turner. Published by the Indian Central Cotton Committee.

The present edition of the Technological Reports on Standard Indian Cottons contains several new features of importance, in addition to the inclusion therein of the results of the tests on the Standard Cottons of the 1926-27 season and those of the three preceding seasons, published in Bulletin No. 7, Technological Series No. 3, May 1927. The addition to the series of two new standard cottons representative of the Dholleras crop represents another noteworthy feature in a Bulletin containing much valuable information to cultivator, spinner and scientist.

* * * * * *

In conclusion must be mentioned the comprehensive and clear manner in which the various routine and examination details, tests and general results have been presented and arranged in the preparation of this, the eleventh Bulletin of the series.

"The Indian Textile Journal," Vol. XXXVIII, No. 449, 29th February, 1928—Page 143.

IMPROVEMENT OF INDIAN COTTON.

* * * * * *

The Committee maintained their usual practice of supplying sample bales of improved cottons to the East India Association, the Liverpool Cotton Association and the Manchester Cotton Association with a view to enable them to compare the genuine article with the varieties available in the market and also notice the possibilities of the best types. Through their Technological Laboratory extensive and elaborate research work is being carried on in the improved grades. Of their many reports we must mention the thoroughness of three of them issued lately: Bulletin No. 9 gives the results of an investigation into the effect of temperature and humidity on cotton spinning with particular reference to conditions in Bombay; Bulletin No. 10 treats of the effect of subjecting cotton to repeated blow-room treatment, while Bulletin No. 11 consists of technological reports on the standard Indian cottons. It is needless to say that the Committee and their laboratory under Mr. A. James Turner, fully justify their existence.

"Textile Manufacturer," Vol. LIV—No. 644, August 1928—Page 267.

Indian Central Cotton Committee Bulletins 13, 14, 15, 16. By A. J. Turner, M.A., B.Sc., Bombay.

Bulletin No. 16 is the annual report of spinning and other tests of standard Indian cottons. These tests have been carried out for several years, and the figures correspond very closely with those of previous years. Nevertheless, in view of the great increase of consumption of Indian cotton in this country during the last year or more, and the constant recommendations to use Indian cotton for the production of coarse counts and the lower numbers of medium counts, an abstract from the figures is given on another page of this issue. The same report also includes discussion of the methods adopted in the tests.

Bulletin No. 13 has the title "Research in Cotton Technology in India." The technology is that of marketing and spinning, and the bulletin is an abstract of several reports made during the year. Two important conclusions are that repeated opening and scutching effect a slight improvement in cleaning, and that cotton should be cleaned as far as possible prior to baling. Once cotton has been pressed into bale form it may be difficult to remove the foreign matter completely, to the detriment of the appearance and value of the yarn,

Bulletin No. 15 is a discussion on "The effect of using unbalanced drafts in spinning tests." An appendix forms an interesting paper on the conceptions of drafting.

Bulletin No. 14 is on "The effect of different spindle speeds on the results of spinning tests." The results obtained at the high spinning speed are identical with those at the low spinning speed. Reasons are given to show that an increase of spinning speed will cause an increase of breakages, owing to the increased tension of winding-on, machinery vibration, etc., if a cotton is being spun near its spinning limit. But within the limits there is no disadvantage in spinning at the highest possible speed.

The papers are in all cases clearly written and comprehensible to the responsible man without scientific training, and deserve the study of every expert spinner, and of course particularly the ring spinner or the user of Indian cotton.

The Empire Cotton Growing Review.—This Journal regularly prints the summaries of our various bulletins; in addition, in Vol. IV, October 1927, it reprinted the whole of the Introduction to "Technological Reports on Standard Indian Cottons, 1923-26" with the following editorial comment:—

> "The first 19 pages of the Report have been reprinted here, as they contain an extremely interesting and detailed account of Spinning Tests on Indian Cottons. A number of references to later portions of the Report appear in these pages, and have been allowed to stand to enable the reader to appreciate the ground covered by Mr. Turner. The whole of the bulletin could not be reprinted by reason of its bulk."

International Cotton Bulletin.—This Bulletin publishes regularly the summaries of our bulletins. The issue for November 1927 (Vol. VI, No. 21, p. 103) reviews our Bulletin No. 9, relating to the effect of temperature and humidity on cotton spinning, and adds the comment:

> "The Bulletin shows the very careful manner under which these tests were carried out. Those using East India cotton should not fail to study this report."

The issue for April 1928, (Vol. VI, No. 23, pages 510-514) give a full account of "Technological Reports on Standard Indian Cottons, 1927."

APPENDIX X.

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31st MARCH 1928.

RECEIPTS.	Rs.	a.	p.
* Opening Balance	26,26,573	15	7
Receipts under Section 12 of the Indian Cotton Cess Act, 1923 ..	5,55,098	9	8
† Other Receipts	17,719	13	10
Interest on investments	1,44,809	7	4
Total Rs.	33,44,201	14	5

EXPENDITURE.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I. Administration of the Committee (including Improvement of Cotton Marketing)		2,00,705 13 10	
Less : Refunds from Government of India *re.* Leave and Pension Contributions paid during previous years	2,406 0 6		
Refund on account of sale of Type Bales received from East India Cotton Association ..	1,058 10 6	3,464 11 0	1,97,241 2 10
II. Agricultural Research Grants-in-aid			3,56,879 8 5
III. Technological Research			1,26,279 2 3
IV. Closing Balance			‡26,63,802 0 11
Total Rs. ..			33,44,201 14 5

* This amount includes Rs. 30,739-12-10 on account of Balance of Provident Fund.
† Includes Rs. 16,309-11-4 on account of contributions to the Committee's Provident Fund.
‡ This amount includes Rs. 47,049-8-2 on account of Provident Fund Account.

We have examined the above statement of Receipts and Expenditure of the Indian Central Cotton Committee with the books, vouchers and certified returns of the Committee, have obtained all the information and explanations we have required, and certify that to the best of our information and explanations received the above statement is a correct abstract of the figures appearing in the books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, *8th May*, 1928.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors

BALANCE SHEET AS ON 31st MARCH, 1928.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		53,10,906 1 11	I. Administration		6,64,622 4 4
INTEREST ACCOUNT.			(*b*) Improvement of Cotton Marketing ..		57,450 11 1
Amount received on investments & fixed deposits.	4,41,026 0 8		II. *Technological Research.*		
Refunds of income-tax deducted on interest ..	8,718 13 0		(*a*) Capital Expenditure.		
	4,49,744 13 8		1. Lands and Buildings	3,55,797 9 11	
			2. Machinery	78,385 0 3	
			3. Freight	7,502 2 8	
			4. Apparatus and Equipment ..	41,558 3 7	
			5. Machinery Workshop	5,789 8 3	
Interest paid in advance at the time of pucrhasing Govt. paper since recovered and bank's commission on interest collection	24,481 11 1		(*b*) Working Expenses	4,67,488 2 6	
Income-tax deducted on interest on Govt. Securities	9,277 11 0				9,56,520 11 2
Interest credited to Provident Fund Account ..	3,109 13 3		III. Research Studentships		1,24,602 12 9
Bank's withdrawal charges for Tax-free loan when sold	1,507 8 0		*Agricultural Research Grants.*		
	38,376 11 4	4,11,368 2 4	IV. Bombay	2,75,097 14 1	
Profit on conversion of 6 per cent. 1926 Bonds to 5 per cent. 1935 Taxables		5,000 0 0	V. Madras—Herbaceum	51,627 6 0	
Miscellaneous Receipts		4,601 1 10	,, Pempheres and Physiological ..	782 9 0	
Provident Fund Account.			VI. Punjab—Botanical	1,46,164 1 11	
Subscribers' contributions	25,278 10 10		,, Entomological	33,734 0 0	
Committee's ,, ...	24,661 4 8		VII. Central Provinces	1,15,754 14 7	
Recoveries against advances	1,750 0 0		VIII. United Provinces	83,351 13 0	
	51,689 15 6		IX. Indore	5,84,676 12 0	
			X. Sind	17,830 0 0	
Refunds to subscribers resigned	2,640 7 4		XI. Burma..	2,906 15 5	
Advances	2,000 0 0				13,11,926 6 0
	4,640 7 4	47,049 8 2	Suspense Account		5,941 11 6
			Investments and Casb Balances—		
			(1) General Account	26,10,810 13 3	
			(2) Provident Fund Account	47,049 8 2	
					26,57,860 5 5
Total ..		57,78,924 14 3	Total ..		57,78,924 14 3

APPENDIX XI.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH SCHEMES UP TO 31st MARCH 1928.

Major Heads.	Total Sanctioned grant.	Period.	Date of starting of work.	Total Expenditure upto 31st March 1928.	Expenditure from Capital grants on (a) Lands and buildings.	Expenditure from Capital grants on (b) Machinery and apparatus and other movable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
II. *Technological Research.*	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(a) Capital Expenditure..	5,04,799 3 8	Permanent.	1923.	9,56,520 11 2	3,55,797 9 11	1,33,234 14 9	15,233 0 8	4,52,255 1 10	*This includes Rs. 1,432-1-4 reserved for re-allotment under Technological Working and Rs. 359-14-0 for re-allotment under Fumigation experiments.
(b) Working Expenditure.	*4,69,280 1 10		Jan. 1924.						
AGRICULTURAL RESEARCH GRANTS:									
IV. *Bombay Schemes.*									
(1) Surat Physiological				1,06,140 10 1	....	....	14,968 14 11†	91,171 11 2†	† Figures for 1927-28 taken from budget estimates and subject to revision on receipt of annual returns.
(2) Surat Bollworm	3,25,000 0 0	Five years.	Septr. 1923.	70,391 6 0	....	....	4,626 7 2†	65,764 14 10†	
(3) Dharwar Wilt and Cotton Breeding				91,291 1 0	....	....	9,974 10 4†	81,316 6 8†	
(4) Khandesh Cotton Breeding ..	25,000 0 0	5 years.	Oct. 1926.	7,274 13 0	....	....	....	7,274 13 0†	
V *Madras Schemes.*									
(a) Herbaceum	60,000 0 0	Do.	Dec. 1923.	51,627 6 0	....	....	2,844 11 9	48,782 10 3	
(b) Pempheres & Physiological	2,75,000 0 0	Do.	Not started.	782 9 0	....	....	....	782 9 0	
VI. *Punjab Schemes.*									
A. Botanical Scheme.					22,210 0 0†	8,490 0 0†			
(a) Capital expenditure ..	‡30,700 0 0	Do.	Aug. 1925.	1,46,164 1 11	....		6,030 7 2†	1,09,433 10 9†	‡This amount includes Rs. 1,400 transferred to capital grant.
(b) Working expenditure.	§2,23,600 0 0								
B. Entomological.									
(a) Capital expenditure ..	6,000 0 0			33,734 0 0	....	5,696 11 0†			§ This amount excludes Rs. 1,400 transferred as above.
(b) Working expenditure.	85,000 0 0	Do.	May 1926.				1,369 6 0†	26,667 15 0†	
VII. *Central Provinces*	61,000 0 0	2½ yrs.	Oct. 1923	1,15,754 14 7	....	....	9,411 0 7	1,06,343 14 0	
	99,000 0 0	3 yrs.	April 1926.						
VIII. *United Provinces, Pink Bollworm Scheme.*									||The balance of this amounting to Rs. 3,100-13-5 lapsed owing to revision of scheme.
(a) Capital expenditure ..	54,000 0 0	..	....	83,351 13 0	....	44,522 12 0	....		
(b) Working expenditure.	50,000 0 0	4 yrs.	April 1925.				2,396 12 3	36,432 4 9	
(c) Recurring grant for staff	25,200 0 0	5 yrs.	Sep. 1926.			....	....		
IX. *Institute of Plant Industry, Indore.*									¶ This includes Rs. 50,202-12-10 transferred from recurring grant.
(a) Capital expenditure ..	¶2,83,536 11 9	Permanent.	Oct. 1924.	5,84,676 12 0	2,12,552 11 5	70,984 0 4	....	....	
(b) Working expenditure.	ƒ3,01,140 0 3			....	....	....	31,857 4 4	2,69,282 11 11	ƒ This excludes Rs. 50,202-12-10 transferred to Capital grant.
X. *Sind*	1,00,000 0 0	5 yrs.	July 1927.	17,830 0 0	....	....	5,000 0 0†	12,830 0 0	
XI. *Burma*—Capital	3,000 0 0	..	....	2,906 15 5	....	2,906 15 5	....	....	
Total ..	29,81,256 1 6	..	....	22,68,447 1 2	5,90,560 5 4	2,65,835 5 6	1,03,712 11 2	13,08,338 11 2	

Summary.

		Rs. a. p.
Capital Grants	(a) Land and Buildings	5,90,560 5 4
	(b) Machinery, apparatus and other movable property	2,65,835 5 6
Apparatus and equipments of a permanent or semi-permanent nature purchased from annual grants ..		1,03,712 11 2
	Total Rs...	9,60,108 6 0

APPENDIX XII.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS.

Technological Research Laboratory.

1.	Director, Technological Research Laboratory, Bombay.	Mr. A. James Turner, M.A. (Cantab), 1st Class Parts I and II Natural Sciences Tripos, B.Sc. (London).	Late Professor of Textile Technology, University of Manchester, and College of Technology, Manchester.
2.	Spinning Master, Technological Research Laboratory, Bombay.	Mr. R. P. Richardson, A.T. I, London City and Guilds Full Honours Certificate.	——
3.	Senior Research Assistant (Chemist), Technological Laboratory, Matunga, Bombay.	Mr. D. L. Sen, M.Sc. Tech. (Manch.), M.Sc., A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
4.	Assistant Technologist	Mr. D. F. Kapadia, B.Sc., Tech. (Vict.), B. A. (Bom.).	Research Scholar, Technological Research Laboratory (Textile Physics).
5.	Junior Research Assistant (Microscopist), Technological Laboratory, Matunga, Bombay.	Mr. H. N. Dutt, B.Sc., M.B.	Recently Demonstrator in Botany, Gujerat College, Ahmedabad.
6.	Junior Research Assistant (Microscopist), Technological Laboratory, Matunga, Bombay.	Mr. Amar Nath Gulati, M.Sc.	Imperial Institute of Veterinary Research, Mukteswar, U.P.
7.	Junior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (1st Class First), Calcutta University.	Research Scholar, Technological Research Laboratory (Textile Physics).
8.	Junior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc.	Do. do.
9.	Statistician	Mr. V. Venkataraman, M.A. (Madras) 1st Class Honours in Mathematics.	Recently Statistical Assistant, Labour Office, Bombay.
10.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.). ..	—
11.	Junior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.). ..	—
12.	Junior Tester	Mr. K. G. Deo, passed Examination in Arts, Bombay.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS.—*contd.*

TECHNOLOGICAL RESEARCH LABORATORY—*concld.*

13.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	—
14.	Junior Tester	Mr. K. S. Marar, B.A.	—
15.	Junior Tester	Mr. H. R. Nayak, Inter Science (Madras). ..	—
16.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	—
17.	Junior Tester	Mr. G. D. Bhide, B.Sc.	—
18.	Junior Tester	Mr. K. V. N. Nayar	—
19.	Junior Tester	Mr. V. N. Modak, B.Sc.	—
20.	Junior Tester	Mr. L. V. Sundararaman, B.A.	—
21.	Junior Tester	Mr. P. S. Sambamurthi	—
22.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	—
23.	Spinning Assistant	Mr. N. Iyengar	—

INSTITUTE OF PLANT INDUSTRY, INDORE.

24.	Director, Institute of Plant Industry, Indore.	Mr. A. Howard, C.I.E., M.A. (Cantab). ..	Recently Imperial Economic Botanist.
25.	Physiological Botanist	Mrs. G. L. C. Howard, M.A. (Dublin), M.A. (Cantab).	Recently 2nd Imperial Economic Botanist.
26.	Assistant in charge of Extension Work...	Mr. K. R. Joshi, L.Ag. (Nagpur).	Lent by Indore State Agricultural Department. 15 years in Indore State Agricultural Department.
27.	Personal Assistant to the Director ..	Mr. Misri Lal Saksena, L.Ag. (Cawnpore). ..	6 years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*concld.*

28.	Assistant in charge of the Seed in Experimental Farm.	Mr. G. C. Tambe, B.Ag. (Bombay).	—
29.	Botanical Assistant	Mr. T. C. N. Singh, M.Sc. (Lucknow). ..	Recently Lecturer in Botany, Lucknow University.
30.	Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay). ..	Research Student, Indian Central Cotton Committee.
31.	Junior Assistant	Mr. Kuber Singh, B.Ag. (Bombay).	—
32.	Junior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad). ..	—
33.	Junior Assistant	Mr. S. C. Talesara, B.Ag. (Bombay).	Research Student, Indian Central Cotton Committee.

BOMBAY RESEARCH SCHEMES.

(1) *Physiological.*

34.	Botanist in charge of Cotton Research Scheme No. I—Physiology of the Cotton Plant in Gujerat.	Mr. K. V. Joshi, M.Ag. (Bombay).	On deputation from Bombay Department of Agriculture.
35.	Senior Research Assistant	Mr. S. V. Godbole, M.Sc., B.Ag.	—
36.	Junior Research Assistant	Mr. N. M. Nitimargi, B.Ag. (Bombay). ..	On deputation from Bombay Department of Agriculture.
37.	Junior Research Assistant to the Cotton Physiologist.	Mr. A. K. Shah, B.Ag. (Bombay).	On deputation from Bombay Department of Agriculture.
38.	Junior Assistant	Mr. R. B. Gode, M.Sc.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(ii) *Mycological.*

39.	Special Cotton Mycologist in charge of the Cotton Wilt Disease and Cotton Breeding Scheme, Dharwar.	Mr. G. S. Kulkarni, M.Ag. (Bombay). ..	Assistant Mycologist and Assistant Professor of Mycology, Poona College of Agriculture. On deputation from Bombay Department of Agriculture.
40.	Senior Assistant	Mr. B. B. Mundkur, M.A. (Madras), 1st Class Honours in Botany and Gold Medallist.	—
41.	Junior Assistant	Mr. R. K. Kulkarni, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
42.	Junior Assistant	Mr. T. R. Khadilker, B.Ag. (Bombay) (with advanced Botany).	On deputation from Bombay Department of Agriculture.

(iii) *Entomological.*

43.	Cotton Entomologist, Spotted Bollworm Investigation.	Mr. Ramrao S. Kasargode, L.Ag. (Bombay) ..	Assistant Professor of Entomology, Agricultural College, Poona—on deputation.
44.	Assistant	Mr. B. P. Deshpande, B.Ag. (Bombay), 1st Class.	On deputation from Bombay Department of Agriculture.
45.	Assistant	Mr. S. G. Kadkol, B.Ag. (Bombay).	Do. do.
46.	Assistant	Mr. N. T. Nadkarni, B.Ag. (Bombay). ..	—
47.	Assistant	Mr. B. J. Thakar, B.Ag. (Bombay).	On deputation from the Bombay Department of Agriculture.

(iv) *Khandesh Cotton Breeding Scheme.*

48.	Graduate Assistant	Mr. R. C. Pendse, B.Ag. (Bombay).	On deputation from the Bombay Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS—*contd.*

BOMBAY RESEARCH SCHEMES—*concld.*

Khandesh Cotton Breeding Scheme—concld.

49.	Graduate Assistant	Mr. Y. R. Yardi, B.Ag. (Bombay).	—
50.	Fieldman	Mr. R. A. Rao	—

(v) *Sind Research Scheme.*

51.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc., 1st Class	—
52.	Senior Assistant	—	—
53.	Junior Assistant	Mr. Rustom M. Ranji, Dip. in Ag. (Bombay).	—
54.	Junior Assistant	Mr. R. G. Deshpande, B.Ag.	On deputation from Bombay Department of Agriculture.

CENTRAL PROVINCES RESEARCH SCHEME.

(i) *Botanical.*

55.	Second Economic Botanist	Mr. D. N. Mahta, B.A. (Oxon), F.L.S. ..	—
56.	1st Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. S. C. Roy, L.Ag. and Post Graduate, Pusa.	On deputation from Central Provinces Agricultural Department.
57.	2nd Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.). ..	Do. do.
58.	3rd Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. L. Janoria, L.Ag., (Hons.).	On deputation from Central Provinces Agricultural Department.
59.	4th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. Y. Bhand, L.Ag. (Hons.).	Do. do.
60.	5th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. S. S. Pande, M.Sc.	Research Student, Indian Central Cotton Committee.
61.	6th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. S. G Kolte, L.Ag.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS.—*contd.*

CENTRAL PROVINCES RESEARCH SCHEME—*concld.*

(ii) *Mycological.*

62.	Senior Mycological Assistant for Cotton Plant Diseases.	Mr. Jiwan Singh, M.Sc. (Punjab), 1923. ..	Research Student, Indian Central Cotton Committee.
63.	Junior Mycological Assistant for Cotton Plant Diseases.	Mr. V. N. Paranjpe, B.Sc.	—

MADRAS HERBACEUM SCHEME.

64.	Herbaceum Botanist	Mr. R. Chockalingam Pillai, L.Ag.	On deputation from Madras Department of Agriculture.
65.	Assistant	Mr. S. N. Venkataraman, B.A., B.Sc. (Ag.). ..	Do. do.
66.	Assistant	Mr. P. Abraham, B.A. (1st Class).	—
67.	Assistant	Mr. G. Seshadri Ayyangar, M.A.	—
68.	Sub-Assistant	Mr. D. Devasirvatham, Government Tech. Exam. in Botany.	On deputation from Madras Department of Agriculture.

PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

69.	Cotton Research Botanist	Mr. Trevor Trought, M.A. (Cantab), 1st Class Nat. Sci—Tripos Agric. Diploma, Cambridge University Development Board Scholar.	Recently Senior Botanist, Ministry of Agriculture, Egypt, for 6 years attached Cotton Research Board.
70.	Technical Assistant	Chaudhri Mohd. Akbar, L.Ag. (3 years). ..	On deputation from Punjab Department of Agriculture.
71.	Technical Assistant	Bh. Sarup Singh, L.Ag. (4 years).	On deputation from the Punjab Department of Agriculture.
72.	Technical Assistant	Ch. Mohd. Rashid, L. C. Course.	Do. do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS—*concld.*

PUNJAB RESEARCH SCHEMES—*concld.*

73.	Technical Assistant	Mr. Akbar Ali, B.Sc. (Post Graduate). ..	Research Student, Indian Central Cotton Committee. On deputation from the Punjab Department of Agriculture.

(ii) *Entomological.*

74.	Assistant Cotton Entomologist in charge, Pink Boll-worm Research Scheme.	Mr. Sohan Singh Bindra, M.Sc.	Research Student, Indian Central Cotton Committee.
75.	Field Assistant	Mr. Ladha Ram, B.Sc.	—
76	Field Assistant	Mr Ganda Ram, B.Sc.	—
77.	Field Assistant	Mr. Dev Raj, B.Sc. (Hons. School).	—
78.	Statistical Assistant	Mr. Rishi Kesh, B.A. (Punjab).	—

UNITED PROVINCES RESEARCH SCHEME.

79.	Research Assistant, Pink Boll-worm Investigations. ..	H. D. Nangpal, M.Sc.	Research Student, Indian Central Cotton Committee.
80.	Junior Assistant, Pink Boll-worm Investigations.	Mr. V. R. Singh, L.Ag. (Cawnpore).	Research Student, Indian Central Cotton Committee.

APPENDIX XIII.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	Sohan Singh Bindra, M.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	Assistant Entomologist, Lyallpur, Pink Bollworm Research Scheme.	Indian Central Cotton Committee.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Government Scholar at Imperial College of Tropical Agriculture, Trinidad.	....
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do.	Senior Research Assistant, Central Provinces Botanical Research Scheme.	Indian Central Cotton Committee.
6 ,,	Jiwan Singh, M.Sc. (Punjab).	Nagpur	Cotton Mycology ..	Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.	Indian Central Cotton Committee.
,,	Ilabonto Banerji, M.Sc. (Calcutta).	Coimbatore. ..	Cotton Botany ..	Unemployed	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph. D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.
,,	B. B. Desai, B.Ag. (Bombay).	Dharwar	Do. ..	Cotton Breeder, Sind, Bombay Agricultural Service.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924.	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore ..	Do. ..	(No record)	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Junior Research Assistant, (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
4 1924.	H. D. Nangpal, B.Sc. Honours School (Punjab).	Cawnpore	Cotton Entomology.	Assistant Entomologist, Pink Boll-worm Investigation, United Provinces.	Indian Central Cotton Committee.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology .	....	Resigned on August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925.	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	Research Assistant under the Entomologist to Government, United Provinces, Cawnpore.	Indian Central Cotton Committee.
,,	Akbar Ali, B.Sc. (Punjab). ..	Lyallpur	Cotton Botany (Plant Breeding).	Technical Assistant to Cotton Research Botanist, Punjab.	Indian Central Cotton Committee.
,,	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology	Entomological Assistant, Punjab Agricultural Department.	....
8 ,,	S. E. Kumana, B.A., B.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Dharwar.	Indian Central Cotton Committee.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Graduate Assistant to the Special Cotton Mycologist, Dharwar.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca). ..	Tehnological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Coimbatore.	Indian Central Cotton Committee.
,,	L. N. Rao, M.Sc. (Calcutta) ..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Centra College, Bangalore.	Resigned in August 1926.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926.	D. F. Kapadia, B.A., B.Sc. (Tech. Manchester).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Junior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology..	Research Student	Studentship extended.
,,	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., B.Sc. (Bombay).	Coimbatore ..	Cotton Bio-chemistry.	Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Assistant at the Sakrand Experimental Station, Sind.	Bombay Agricultural Department.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Junior Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
1927.	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay	Cotton Technology .	Research Student ..	Under training.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Do. ..	
,,	Dev Raj Mehta, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	Do. ..	

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Cotton Entomology.	Research Student ..	Under training.
9 ,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology ..	Do. ..	
,,	Sant Singh Varma, M.Sc. (Benares Hindu University)	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	Do. ..	
,,	Lakshmi Narayan Mathur M. Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding .	Do.	
,,	Kadaba Rangaswamy, M.Sc (Calcutta).	Coimbatore.. ..	Do. ..	Do. ..	
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....
1928.	K. Dharmarajulu, B.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Research Student ..	Under training.
,,	Piare Mohan, B.Sc. (Honours School) Punjab.	Cawnpore	Cotton Entomology.	Do. ..	
5 ,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Do. ..	
,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (Univ. of Edin.).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Do.	
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Do. ..	
39 Total.					

" Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants.

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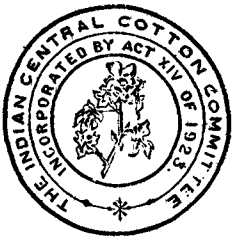

ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

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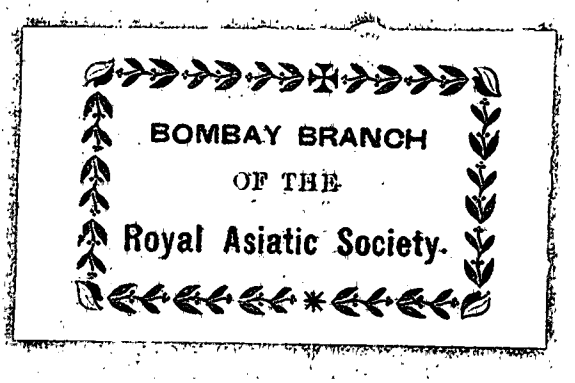
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ANNUAL REPORT

OF THE

Indian Central Cotton Committee, Bombay,

FOR THE

Year ending 31st August 1929.

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1929.

CHAPTER I.

THE formation of the Indian Central Cotton Committee was the direct outcome of the recommendations of the Indian Cotton Committee (the McKenna Committee) whose report was published in 1919. As first constituted, by Resolution No. 404-22 of the Government of India in the Department of Revenue and Agriculture, dated the 31st March 1921, the Committee was purely advisory, but in 1923 the Government of India passed the Indian Cotton Cess Act, 1923 (Act No. XIV of 1923) which is described in the preamble as "An Act to provide for the creation of a fund for the improvement and development of the growing, marketing and manufacture of cotton in India." Under the Act the Committee was incorporated and provision made for the levy of a cess of four annas for the first three years and after that period, of two annas a bale on all cotton exported and consumed in mills in British India.

2. All cotton interests are represented on the Committee as a perusal of the personnel in para 4 below will show. The value of having a common meeting-ground for all sections of the Trade is apparent and there can be little doubt that the legislation already passed by the Government of India would have been impossible had there been no Committee in existence to make recommendations. The organization will also be of great benefit when the Committee's research schemes come to fruition and improved cottons come into the market in commercial quantities.

3. The work of the Committee falls under the following main heads :—

(1) *ADVISORY.*—The Committee advises both the Central and Provincial Governments in all cotton matters by dealing with references made to it and also by taking the initiative on subjects which it considers require attention.

(2) *IMPROVEMENT OF COTTON MARKETING.*—The Committee recommended to the Government of India two important pieces of legislation which have been of great value in obtaining for the grower a better price for his produce. Eight investigations into the methods of marketing cotton in the major cotton-growing provinces of British India have also been carried out by means of funds provided by the Committee and recommendations have been made to Local Governments on each inquiry.

(3) *STATISTICAL.*—The Committee has made itself responsible for the greater reliability of all statistics dealing with Indian raw cotton and has already achieved considerable success. The Committee also acts as an information bureau for all interested in cotton.

(4) *AGRICULTURAL RESEARCH.*—This is carried out at the Indore Institute of Plant Industry whose funds are derived mainly from the Committee and also by grants-in-aid to Provincial Agricultural Departments for definite lines of work approved by the Committee.

(5) *TECHNOLOGICAL RESEARCH* is carried out in the Committee's own Technological Laboratory in Bombay. In addition to the Spinning Laboratory where tests on Standard Indian Cottons and on samples of new strains produced by the Agricultural Departments are made, the Research Laboratory deals with the determination of the properties of the cotton fibre.

(6) *TRAINING OF RESEARCH WORKERS.*—The Committee provides scholarships for the training of research workers in the different sciences connected with cotton. Apart from training its own staff for much of the research work being carried out in the provinces and in its own Institutes, many ex-holders of the Committee's scholarships have been absorbed for cotton work by various Agricultural Departments.

(7) *FUMIGATION OF AMERICAN COTTON* was undertaken from 1925 by the Committee, on its recommendation, to prevent the possibility of the Mexican boll-weevil entering India.

PERSONNEL.

4. Under Rule 3 of the Indian Cotton Cess Rules, members hold office for three years and one-third retire each year in rotation. The members for 1929 are:—

(1) PRESIDENT—Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex officio.*

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural Matters, *ex officio.*—Mr. B. C. Burt, C.I.E., M.B.E., B.Sc., I.A.S.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. R. D. Anstead, C.I.E., I.A.S., Director of Agriculture. (On leave.)
Bombay	Mr. T. F. Main, O.B.E., I.A.S., Director of Agriculture. (On leave.)

United Provinces	Mr. G. Clarke, C.I.E., I.A.S., Director of Agriculture.
Punjab	Mr. D. Milne, C.I.E., I.A.S., Director of Agriculture.
Central Provinces	Mr. F. J. Plymen, C.I.E., I.A.S., Director of Agriculture.
Burma	Mr. T. D. Stock, I.A.S., Deputy Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex officio*.—Dr. D. B. Meek, O.B.E.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Major W. Ellis Jones, M.L.C.
The Bombay Millowners' Association .	Mr. S. D. Saklatvala (*Vice-President*).
The Bombay Chamber of Commerce ..	Mr. T. G. Ralli.
The Indian Merchants' Chamber, Bombay ..	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E., M.L.A.
The Karachi Chamber of Commerce ..	Mr. G. C. R. Coleridge.
The Ahmedabad Millowners' Association..	Seth Kasturbhai Lalbhai.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce	Mr. H. A. Wilkinson.
The Empire Cotton Growing Corporation.	Mr. W. Roberts.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Sir Sorabji B. Mehta, Kt., C.I.E. Rao Bahadur K. J. Deshmukh.
Madras	Mr. Robert Lee.
Punjab	Rai Bahadur Lala Sewak Ram, M.L.C.
Bengal	Mr. Girija Prasanna Chakravarty.

(7) CO-OPERATIVE BANKING REPRESENTATIVE.—Rao Saheb V. Krishna Menon, B.A.

(8) REPRESENTATIVES OF COTTON GROWING INDUSTRY.

Madras	M.R.Ry. R. Appaswamy Naidu Garu. M.R.Ry. K. Sarabha Reddi Garu, M.L.C.
Bombay	Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Saheb Chenbasappa Shidramappa Shirahatti.
United Provinces ..	Rai Bahadur Amba Prasad, M.L.C. Rai Saheb Bikram Sinha, M.L.C.
Punjab	Capt. L. H. G. Conville. Sardar Ujjal Singh, M.A., M.L.C.
Central Provinces and Berar.	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe, B.A., LL.B., M.L.C.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General of Commerce and Industry.
Baroda State	Mr. C. V. Sane, B.Ag., M.Sc., Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Administrative Officer, Department of Agriculture.
Rajputana and Central India States	Mr. A. Howard, C.I.E., Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Dr. W. Youngman, Economic Botanist to Government, Central Provinces.
2. Dr. W. Burns, I.A.S., Acting Director of Agriculture, Bombay.
3. Dr. L. C. Coleman, Director of Agriculture, Mysore State.
4. Mr. G. R. Hilson, B.Sc., I.A.S., Acting Director of Agriculture, Madras.
5. Mr. C. R. Palairet, Member for Commerce and Industry, Holkar Durbar, Representative of the Indore State.
6. Mr. K. I. Thadani, Botanist, Sakrand Station.
7. Lala Niranjan Prasad, Representative of the Karachi Indian Merchants' Association, Karachi.

Secretary—Mr. J. H. Ritchie, M.A., B.Sc., I.A.S. (On leave.)
Deputy Secretary—Mr. W. J. Jenkins, M.A., B.Sc., I.A.S., Offg. Secretary.
Director, Technological Laboratory—Dr. A. James Turner, M.A., D.Sc.

Dr. D. Clouston, C.I.E., Agricultural Adviser to the Government of India, relinquished the Presidentship of the Committee on his retirement in April. At the July meeting the Committee recorded its appreciation of his services in the following resolution :—

" The Central Cotton Committee desire to place on record their appreciation of the work of Dr. Clouston who was a member of the Committee for seven years and its President from 1924-28. *Dr. Clouston's tact and co-operation have contributed largely to the success of the Committee's meetings."*

Dr. W. McRae, Officiating Agricultural Adviser to the Government of India, presided over the nineteenth meeting of the Committee in July 1929.

The Linlithgow Commission recommended the abolition of the post of Agricultural Adviser to the Government of India and suggested that the Vice-Chairman of the Imperial Council of Agricultural Research should become President of the Committee *ex officio*. This recommendation was accepted by the Committee and the Cotton Cess Act has been amended accordingly.

Mr. S. D. Saklatvala, representative of the Bombay Millowners' Association since 1926, was elected Vice-President for the year 1929-30.

SUB-COMMITTEES.

5. The following members were appointed to form the *Standing Finance Sub-Committee* required by the Rules under the Indian Cotton Cess Act :—

Mr. S. D. Saklatvala (*Vice-President*), Mr. W. Ellis Jones, Sir Purshotamdas Thakurdas, Mr. G. C. R. Coleridge, Seth Kasturbhai Lalbhai, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. T. G. Ralli and Mr. J. Vonesch.

Sir Sorabji B. Mehta was appointed a member during the absence out of India of Major W. Ellis Jones from 23rd March to 12th July 1929.

Ten meetings were held during the year.

6. *The Local Sub-Committee* was composed of the following members:—

Mr. S. D. Saklatvala (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. G. C. R. Coleridge, Seth Kasturbhai Lalbhai, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. T. G. Ralli, Mr. J. Vonesch, Mr. C. V. Sane, Sir Sorabji B. Mehta, Mr. W. Ellis Jones and Mr. M. P. Kolhe.

Sir Sorabji B. Mehta was appointed to this Sub-Committee during the year.

This Sub-Committee consists of all members living in or near Bombay and any others who may be in Bombay at the time of a meeting. It deals with all matters of general interest between meetings of the full Committee which is thus relieved of a considerable amount of work at the time of the half-yearly meetings. There were eight meetings held during the year.

7. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee was appointed for the purpose of Section 2 (*f*) of the Cotton Ginning and Pressing Factories Act of 1925 to deal with matters arising out of the Act. The membership for 1929 is as follows :—

Mr. S. D. Saklatvala (*Vice-President*), Mr. W. Ellis Jones, Sir Purshotamdas Thakurdas, Mr. G. C. R. Coleridge, Mr. T. G. Ralli, Mr. J. Vonesch, Mr. Robert Lee, Sir Sorabji B. Mehta, Mr. H. A. Wilkinson, Mr. W. Roberts and Rao Saheb V. Krishna Menon.

Three meetings were held during the year.

8. *Special Sub-Committee on the Finance of the Cotton Crop Up-country.* The following members were appointed to form this Sub-Committee :—

Mr. W. Ellis Jones, Mr. T. F. Main, Rao Saheb V. Krishna Menon, Rao Bahadur Bhimbhai Ranchodji Naik, and Sir Joseph A. Kay and Mr. B. F. Madon (co-opted members).

The Sub-Committee met twice during the year and considered the Middle Gujerat, Madras, Punjab and General reports on all the eight inquiries carried out.

The Committee has to record its deep sense of loss in the death of Mr. B. F. Madon, who, though no longer a member, continued to take the greatest interest in its work and particularly in the economic inquiries conducted by the Committee. The Standing Finance Sub-Committee forwarded a resolution of condolence to his relatives and to his firm, Messrs. R. D. Tata & Co., Ltd.

9. *Agricultural Research Sub-Committee.*—This Sub-Committee meets during the meetings of the full Committee and reviews the progress reports of the schemes financed by the Committee, examines new research proposals and studies the reports of Research Students. During the year it consisted of the following members appointed at the eighteenth meeting :—

Dr. D. Clouston, Mr. S. D. Saklatvala, Rao Saheb V. Krishna Menon, Mr. W. Ellis Jones, Mr. W. Roberts, Mr. T. F. Main, Mr. G. R. Hilson, Mr. D. Milne, Dr. W. Youngman, Mr. A. Howard ; Mr. G. Clarke, Mr. B. C. Burt, Mr. C. V. Sane and Dr. L. C. Coleman (additional members) ; Mr. Trevor Trought and Dr. W. Burns (co-opted members) and the Secretary.

Messrs. Anstead and Richards were co-opted for the eighteenth meeting in December 1928 and at the nineteenth meeting in July Messrs. Plymen, Thadani and Roger Thomas of the British Cotton Growing Association, Khanewal, were invited to serve as members.

10. *Technological Research Sub-Committee.*—This Sub-Committee met during the meeting of the Committee in December and again in the month of June, a full month before the monsoon meeting of the Committee. This was necessitated by the Director proceeding on about six months' leave in the middle of June.

The Sub-Committee deals with all matters pertaining to the Technological Laboratory and Technological Research. The following members were appointed in December 1928 :—

The President, The Vice-President (*ex officio*)—Mr. S. D. Saklatvala, Sir Purshotamdas Thakurdas, Sir Sorabji B. Mehta, Mr. W. Ellis Jones, Seth Kasturbhai Lalbhai, Mr. D. Milne, Mr. A. Howard, Mr. B. C. Burt, Mr. T. F. Main, Dr. W. Youngman and the Secretary

11. *Research Students Selection Sub-Committee.*—This Sub-Committee. met at the December meeting to select candidates for scholarships. Only two were appointed at the time but arrangements were made to fill two more posts in a new branch, viz., Cotton Marketing and Economics, for which scholarships were made available.

The whole scheme of the Committee's scholarships was reconsidered by a Special Sub-Committee and the main decisions arrived at will be found in para 76.

12. At the nineteenth meeting it was decided to form a permanent Sub-Committee on Malpractices to deal with all questions relating to abuses and malpractices and to devise measures to combat them. The members of the Sub-Committee are as follows :—

Mr. S. D. Saklatvala (*Vice-President*), Mr. W. Ellis Jones, Sir Purshotamdas Thakurdas, Mr. G. C. R. Coleridge, Mr. T. G. Ralli, Rao Bahadur Bhimbhai Ranchodji Naik, and Mr. T. F. Main.

13. Much of the Committee's work is carried out by means of these Sub-Committees and considerable time is thus saved at the half-yearly meetings of the Committee. The Bombay members have continued to give unsparingly of their time and the Committee owes them, in particular, a deep debt of gratitude.

MEETINGS.

14. The Committee met twice during the year, viz., on the 11th and 12th December 1928 and on the 16th to 18th July 1929. At the December meeting Mr. (now Sir) Frank Noyce, C.S.I., C.B.E., I.C.S., Mr. B. F. Madon and Mr. A. J. Panas attended as visitors and in July Sir T. Vijayaraghava-

chariar, K.B.E., Mr. H. A. F. Lindsay, C.I.E., C.B.E., I.C.S., Joint Secretary to the Government of India, Commerce Department, Mr. M. S. A. Hydari, I.C.S., and Mr. Roger Thomas of the British Cotton Growing Association, Khanewal, were present.

Mr. B. C. Burt was appointed an additional member of the Committee from 9th October 1928, thus raising the membership to 45.

STAFF.

15. Mr. Ritchie held charge of the office of Secretary till 14th March, when he proceeded on eight months' leave. Mr. Jenkins, Deputy Secretary, was appointed to officiate as Secretary.

A new agreement was entered into between the Committee and Dr. Turner, Director, Technological Laboratory, for a further period of five years from 1st January 1929. Dr. Turner proceeded on leave from June 17th to December 5th, 1929, and Mr. Richardson, the Spinning Master, was appointed to act for him. There were no other changes in the Committee's staff during the year.

The London University conferred the degree of Doctor of Science on Mr. Turner during the year.

16. *Provincial and Local Cotton Committees.*—Provincial and Divisional Cotton Committees met as follows during the year ending August 31st, 1929 :—

Madras Provincial Cotton Committee	..	Once.
Central Provinces Cotton Committee	..	Once.
Punjab Provincial Cotton Committee	..	Twice.
Sind Divisional Cotton Committee	..	Twice.

No Provincial Cotton Committee has yet been formed in the Bombay Presidency. Matters of provincial importance were referred to the Central Cotton Committee by the Bombay Government while others of purely local interest were dealt with by the Divisional Cotton Committees.

17. *The Imperial Council of Agricultural Research.*—The Linlithgow Commission recommended the formation of an Imperial Council of Agricultural Research for the promotion, guidance and co-ordination of agriculture and veterinary research throughout India. The Commission's recommendations were somewhat modified by the Government of India and the Central Organization has now been divided into two parts—executive and advisory. The Indian Central Cotton Committee has been given representation on the Advisory Board and at the nineteenth meeting in July Mr. S. D. Saklatvala, *Vice-President,* was appointed to represent the Committee.

Sir Joseph Kay, late Vice-President of the Committee, has been elected by the Associated Chambers of Commerce of India and Ceylon as their representative on the Governing Body of the Council.

CHAPTER II.

THE WORK OF THE YEAR.

18. SEVERAL features stand out prominently in the Committee's work and policy during the year, all of which are more carefully commented on under their respective headings. These are (1) the increasing interest taken by Trade members in the Committee's Agricultural Research Schemes, (2) the utilization of the Committee's Laboratory for testing trade samples, (3) the formation of a permanent Sub-Committee on Malpractices to deal with all references to malpractices and abuses which are adversely affecting Indian cotton and to examine the efficacy of all measures already suggested to stop them, (4) the change in policy whereby the Committee will assist, by the provision of staff or funds, in the wider distribution of the seed of improved varieties of cotton to the growers, (5) the decision of the Committee to help local authorities to disseminate as widely as possible the results of the research schemes financed from the Committee's grants. It was the intention of the Committee to go no further than carry a research scheme to its conclusion and leave Local Governments to do the propaganda work necessary to get the results taken up by the grower. The change in policy should have a marked effect on the rapidity with which improvements are introduced.

19. During the year under review the area of cotton in India was 26,484,000 acres, which was a million and a half acres more than the area of the preceding two years. The season, however, was not a favourable one and the frost at the end of January and early February caused such severe damage to the crop, especially in Gujerat, that the estimated yield was only 5,638,000 bales of 400 lbs., and the average yield per acre only 85 lbs. of lint, compared with the estimated yield of 5,963,000 bales and an average acreage yield of 96 lbs. of lint cotton for the previous season.

The returns of cotton pressed in India are becoming more complete, and these, with the returns of loose cotton received by the mills, form a direct check on the estimated figures of production. During the year under report, 4,059,688 bales were pressed in British India, and the equivalent of 104,074 bales of loose cotton were received in mills; 944,616 bales were pressed in the Indian States. The estimated yields were 3,680,000 bales in British India and 1,958,000 bales in the Indian States. The cotton accounted for in British India is thus about 484,000 bales more than the forecasted crop. Until all Indian States send in cotton press returns it is impossible to detect the sources of error.

The long-drawn-out labour disputes in Bombay and the general strike at the end of April were again responsible for a lower consumption of cotton

in Bombay Island and consequently in India as a whole, although there was a marked increase in other parts of India. During the year under report the total consumption was 1,991,203 bales which, though more than the previous year's figure by about 220,000 bales, is still behind the normal capacity of Indian mills by about 300,000 bales. There was, however, the welcome feature of an increased consumption of Indian cotton in other parts of the world during the year, thereby correcting the abnormal situation caused by the cheapness of American cotton owing to the big crop of 1926. In the United Kingdom the consumption of Indian cotton rose from 121,000 bales in 1927-28 to 183,000 bales in 1928-29, and on the Continent an increase of 190,000 bales took place in the same period. Exports of Indian cotton in the year under review showed an enormous increase over the previous two years. From 2,830,000 bales in 1926-27 they rose to 3,140,000 bales in 1927-28, and to 3,932,500 bales in 1928-29. This increase was due mainly to the comparative cheapness of Indian cotton in consequence of the unsettled condition of the Bombay Mill Industry and to the large stocks of cotton carried over from the previous season. In spite of the heavy export off-take the stocks of unsold cotton in Bombay on the last day of the season show only a reduction of about 59,000 bales from that of the previous season. The following table gives the ascertained stocks of unsold cotton on the 31st August compiled from the East India Cotton Association returns :—

Description.	31st August 1929.	31st August 1928.	31st August 1927.	31st August 1926.	31st August 1925.
Broach	15,053	17,242	15,463	11,493	16,852
Dholleras	40,291	60,336	33,698	30,704	20,097
Oomra	258,790	263,443	41,905	62,378	54,055
Khandesh	57,103	70,238	4,795	15,292	12,464
Bengals	63,121	50,988	12,720	24,193	14,397
Punjab-American	7,471	13,085	3,762	11,188	4,542
Dharwar	5,091	4,870	4,085	4,883	6,850
Comptas, Tinnevellys and Cambodia	29,249	44,346	27,218	20,486	29,176
Westerns and Northerns ..	25,486	27,404	22,628	18,158	26,007
Persian	31	190	200	563	1,476
Americans	333	2,034	1,920	460	..
Egyptians	..	..	5	7	..
East Africans	13,592	9,150	6,659	10,549	4,787
Other sorts	26,363	37,635	6,520	13,326	11,134
Total ..	541,974	600,961	181,578	223,680	201,837

As in the previous season the short-staple Oomras and Bengals form the bulk of the stocks. Because of the unfavourable parity with America the imports of American cotton into India fell off considerably, the actuals being only 10,942 running bales as against 67,531 bales of the previous season, and 324,585 bales in 1926-27.

THE COTTON TRANSPORT ACT.

20. At the request of the Central Cotton Committee the Government of India passed the Cotton Transport Act in 1923 to give powers to Local Governments to protect any area of cotton by restricting and controlling the transport and import of cotton into any notified zone.

21. *BOMBAY.*—The Act was in force in six zones in the Bombay Presidency during the year, viz.,

In Gujerat—the South Surat, the Surat and the Olpad-Ankleshwar zones.

In the Southern Division—the Kumpta-Dharwar, the Bijapur and the Bagalkot zones.

The position in the Gujerat area has not altered since last year and the Committee is still striving to get the road restrictions re-applied between the three protected areas. The policy of the Agricultural Department in this area is to have one improved variety of cotton, viz., 1027, grown south of the Narbada River, and three zones were constituted in order to exclude inferior cotton being grown in the Olpad Taluka. In 1926 the growers in the group of Co-operative Societies round Sonsek in Olpad Taluka assured the Director of Agriculture that they would sow the improved variety, and the road restrictions were withdrawn subject to the condition that they would be re-imposed if it were found that the inferior cotton was still being sown. Indubitable evidence was received at the end of a year's working that the inferior seed was still being sown and in 1928 the Committee pressed for the re-imposition of the road restrictions. Up to date this has not been done, though the Committee hopes that something will eventuate from the conference of all interests which the Hon'ble the Minister for Agriculture, Bombay Presidency, convened to discuss the question.

22. *THE KUMPTA-DHARWAR AREA.*—As mentioned in last year's report, the Government of Bombay established 16 road check stations in the three zones to prevent inferior cotton entering these areas by road from outside. The Committee also recommended to Government that a number of road check stations should be opened in the Sholapur District so as to prevent Barsi and Sholapur cotton entering the protected areas through the Indian States of the Southern Mahratta Confederacy. Three stations have been recommended and the Government of Bombay is now making inquiries into the cost of the establishment required to staff them.

23. *THE PROPOSED BROACH AREA.*—The Committee recommended to the Bombay Government that the Broach area should be

protected under the Cotton Transport Act and suggested that it should comprise the following areas:—

(1) The whole of the Broach District between the Narbada and the Mahi rivers, (2) that portion of the Baroda State which lies between the two rivers, and (3) the whole of the Panch Mahals District and the States of the Rewa Kantha Agency.

The Government of Bombay entered into communication with the Baroda Durbar and the Indian States in the Rewa Kantha Agency with a view to securing their co-operation. The Baroda Durbar is willing to co-operate in the proposed measures and will declare the portion of the new zone lying in Baroda territory a ' protected area ' as soon as the Government of Bombay issue the notification protecting the portion in British territory.

24. *BARODA.*—There was no change in the Cotton Transport Act as applied to Baroda State during the year. The three protected areas corresponding with the Bombay zones in Gujerat were maintained.

25. *RAJPIPLA.*—The whole of this State is covered by a State Law on the lines of the British India Act to protect the improved 1027 variety, the growing of which is compulsory. A few years ago Rajpipla cotton was almost unsaleable, but by excluding outside growths, by the distribution of an improved variety of seed and with the State control of ginning factories the Durbar has raised the cotton of the State up to the standard of the best Surat. In 1925 the East India Cotton Association set up separate standards for this cotton.

26. *CHHOTA UDEPUR STATE.*—This State introduced a Cotton Improvement Act, which came into force in August 1927, similar to the one in force in Rajpipla State. The importation by road or rail of cotton, *kapas*, cotton seed or cotton waste into the State is forbidden except under license. During the year the Government of India declared the provisions of sub-section (1) of Section 4 of the Cotton Transport Act, 1923, applicable to the State. The Durbar has adopted the 1027 variety for cultivation and cotton ginning and pressing factories are under State control.

27. *MADRAS.*—The Cotton Transport Act was put into force in the Madras Presidency in 1925 in three areas, (1) Northerns and Westerns, (2) Tinnevelly, and (3) Tiruppur-Cambodia. The Agricultural Department put forward proposals to increase the number of zones in the south to four, but these proposals did not meet the wishes of certain branches of the Trade which desired to amalgamate the two southern areas. The Madras Government accepted the views of the Trade and moved a revised notification in the Legislative Council constituting only two protected areas in the Presidency. This came into effect from 19th September 1928. The Committee is keeping a watchful eye on the new arrangement and will not hesitate to press for a change if it considers the interests of the grower are being in any way jeopardized.

28. *CENTRAL PROVINCES.*—The Central Cotton Committee has been pressing the Central Provinces Government for some time to apply the Cotton Transport Act to a single protected area so as to exclude the import by rail of inferior Khandesh and Central Indian cottons from the following cotton-growing districts of the Central Provinces and Berar:—Buldana, Akola, Amraoti, Yeotmal, Wardha, Chanda, Nagpur, Chhindwara, Seoni and Bhandara. In June the Central Provinces Government drafted a notification which was sent to the Committee for approval. The same notification was also placed before a joint meeting of the Central Provinces Provincial Cotton Committee and the Board of Agriculture and was approved. It will now be placed before the Central Provinces Legislative Council in January.

29. *INDORE.*—At the instance of the Central Cotton Committee the Holkar and Gwalior Durbars were asked to protect their valuable Malwa cottons by applying a Cotton Transport Act to prevent inferior Rajputana-Bengals cotton entering their territories for adulteration. A Bill was drawn up by the Holkar Government and was approved by the Legislative Committee but owing to some irregularity it has been referred back to the Legislative Committee by the Cabinet. It is hoped to have the Act in operation at no distant date. An Act of this nature will be a great asset when an improved type of cotton is ready for distribution from the Indore Institute of Plant Industry.

The Gwalior Durbar is awaiting the action of Indore before taking up the matter further.

30. *HYDERABAD.*—The Hyderabad State Cotton Cultivation and Transport Act received sanction during the year and the Act* and Rules* thereunder have been published. It has been drawn up on the lines of the Cotton Transport Act of British India and is meant to protect the long-stapled *Bani* or *Gaorani* cotton, which is still grown in an impure state in fairly large areas in the State. The Act protects the cotton-growing areas of the whole of Nander Civil District, the Nirmal Taluka of Adilabad District, Bidar District and those portions of the Bir and Oosmanabad districts lying to the east of Sholapur-Oosmanabad and the Barsi-Mominabad roads. The Act also gives H. E. H. the Nizam's Government power to specify the type of cotton that may be grown.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

31. This Act has now been in operation for four years, though Section 14, the real sanction of the Act, became effective only from the commencement of the 1926 cotton season. As mentioned in last year's report, the

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* Appendix II.

Government of India added a proviso to Rule 7 suspending for a fixed period the operation of Section 14 and asked the Committee to recast the rule so as to cut out those portions of it which experience had shown were unnecessary for the carrying out of the purposes of the Act. The Committee has now decided to permit marking by any means provided the special marks are in decipherable English characters and the rule has been amended accordingly. The East India Cotton Association, also at the request of the Committee, amended their by-laws so as to make only such bales in a tender as are unmarked or wrongly marked liable to rejection and penalty on arbitration instead of the whole tender of which such bales may form a part. These amendments should put a stop to the rejection of tenders for minor faults in the marking which was fairly common in the falling market of last year.

The Government of India again drew the attention of Local Governments to the necessity for a strict enforcement of the provisions of the Cotton Ginning and Pressing Factories Act and to the need for adequate penalties being imposed in established cases of non-observance of the Act and Rules.

All cases of faulty marking brought to the notice of the Committee were reported to the authorities concerned and six prosecutions were instituted, resulting in fines ranging from Rs. 10 to Rs. 80. Two prosecutions were launched against gin owners for failing to have their factory plans approved by the proper authority, and one gin owner was fined for building a factory less than the required width.

The Committee continued to send to the East India Cotton Association, for posting, the names of the owners of cotton which had been rejected for dampness and false packing.

32. The marking of bales is now in force in the following Indian States :—

Hyderabad (the Nizam's Dominions), Baroda, Indore, Alwar, Nabha, Jodhpur, Jaipur, Rajpipla, Navanagar, Cambay, Katosan, Jhalawar, Limbdi, Wankaner, Chhota Udepur, Barwani, Alipura, Savanur, Idar, Jhabua, Rutlam, Datia, Porebander, Morvi, Gondal, Wadhwan, Manavadar, Bhavnagar, Mudhol, Sachin, Junagadh, Bhopal, Dhrangadhra, Radhanpur, Rajkot, Kapurthala, Faridkot, Jind, Tonk, Lakhtar, Bahawalpur, Muli and Mysore.

2. Weekly cotton press returns are received from all the above States except the following :—

Datia, Morvi, Manavadar, Sachin, Junagadh, Radhanpur, Rajkot, Kapurthala, Lakhtar, Bahawalpur, Muli and Mysore.

In June the Mysore Government passed the final reading of a Bill for the marking of bales and the drafting of rules is now under consideration.

The most important cotton-growing Indian States have now introduced the marking of bales and the statistics of cotton production should become more and more reliable. The Committee continues to impress on those States which have not yet done so the need for such legislation, and it is hoped to get a complete tally of all the cotton pressed in India at no distant date.

MALPRACTICES.

33. Dampness due to watering is still a common feature in certain growths of Indian cotton, and unfortunately the malpractice seems to have taken firm root in Gadag and Hubli during the last two years. The local merchant seems to have found another outlet for his energies, the Cotton Transport Act having baulked him of one source of illegitimate profit. The Committee at present can do no more than bring such cases to the notice of the Trade and Government.

At its July meeting, the Committee formed a new Sub-Committee, called the Sub-Committee on Malpractices, whose function will be to deal with all references to malpractices and abuses which are adversely affecting Indian cotton. The Sub-Committee was asked to examine the efficacy of all measures already suggested to check these abuses and to examine in detail the advantages of legislative measures towards the licensing of gins and presses in India in this connection. The first subject which the new Sub-Committee tackled was the much discussed question of the mixing of Punjab-American cotton with "*desi*." The Sub-Committee wish to explore all possible avenues before taking up the thorny question of licensing. The Punjab Government has again been asked to look into the question with a view to preventing the wholesale mixing that takes place. The Committee has also made an offer to give assistance for one year to provide for the necessary staff to organize Co-operative Sale Societies for the production and marketing of pure Punjab-American cotton.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

34. As mentioned in last year's report, the Committee completed five investigations in three Provinces into the finance and marketing of cultivators' cotton. These reports were published during the year, as well as a General Report on all the eight investigations carried out by the Committee. The main points brought out from the investigations are—

(1) That on an average 70 per cent. of the cultivators in each area require loans which are taken before or at the commencement of cultivation operations.
(2) The *sowcar* is the principal financier, being responsible for 65 per cent. of the total borrowings. The landlord or zemindar comes next with 15 per cent.
(3) The *dalal* or agent of the big cotton merchant or firm does not take any direct part in financing the growers.

(4) 55 per cent. of the total loans were obtained at 12 per cent. interest or less.
(5) Lenders do not require any security for loans as a rule, though in Sind borrowers were required to give a written undertaking to sell their *kapas* to or through the lenders.
(6) Except in Sind, growers are not hampered by their borrowings either as regards the persons to whom or the time at which they may sell their *kapas*.
(7) Growers in each of the areas investigated, except Berar, show a decided preference for village sales.
(8) The sale organization in the village is on the whole satisfactory.
(9) The usual method is to sell outright to village or itinerant petty traders. The money-lender is not a purchaser of *kapas* on his own account to any great extent. Except in Sind and Middle Gujerat the agents of the big cotton merchants and gin-owners do not usually purchase cotton direct from the cultivators.
(10) The weights used in the villages are usually crude and the scales not particularly accurate.
(11) The rates in the villages approximate very closely to those in the market.
(12) Early sales were small compared with late sales.
(13) Except in Berar no regulated markets exist anywhere in India.
(14) The organization of the unregulated market varies considerably, some of them being as efficient as the Berar markets, while others are without any form of control.
(15) The method of price fixing varies. In a few markets, buyers bid openly and the highest rate becomes the rate for the day. In others, prices are fixed privately by the buyer and the seller's *adatya*.
(16) Weighment is done at the ginneries where weights and scales are satisfactory.
(17) Disputes are very frequent in all markets and these are the most serious obstacles in the way of market sales.
(18) There is no demand for the provision of storage facilities. The compounds of ginning factories seem to serve the requirements.
(19) In the unregulated markets the number of traders who sell is greater than that of growers.

COTTON MARKETS.

35. The McKenna Committee recommended the Berar type of open cotton market for other parts of India and in 1923 the Central Cotton Committee drafted a Bill on the Berar model with modifications which did away with many of the undesirable features of the Berar Markets. This draft Bill was circulated to all Local Governments and Indian States and has been taken as a model by Bombay, Indore and Hyderabad in framing legislation establishing markets in these places. There are now in operation in Indore State four open markets controlled by Market Committees on which

growers are represented. They are reported to be very successful. The rules have been based on those in Berar with changes to suit local conditions.

Last year H. E. H. the Nizam's Government drew up rules for the establishment of an experimental Cotton Market at Parbhani. It has now been decided to introduce legislation in the State and a Hyderabad Agricultural Markets Bill* has been drawn up and will be put before the Legislative Council. The Bill follows closely the Bombay Cotton Markets Act but, in view of the recommendations of the Royal Commission on Agriculture in India, provision has been made to extend it to other commodities besides cotton, if necessary.

As mentioned in last year's report, the Bombay Cotton Markets Act was passed and rules have now been drawn up and will be put before the Legislative Council for approval.

The Central Provinces Government have still under consideration the modification of the rules under the Berar Market Law. These were drawn up and circulated for opinion and it is hoped the necessary amendments will be brought into operation at an early date.

The adoption of legislation by two large Indian States and by the Bombay Government to regulate the sale of cotton in the markets of their territories and the proposed modification of the Berar Rules constitute the greatest advance in marketing of agricultural produce yet made in India. The appointment of Market Committees on which the grower will be fully represented and the formation of Disputes Sub-Committees should help to do away with the innumerable disputes between buyer and seller which are apt to deter the grower from using the regulated market. The Committee's reports on the Finance and Marketing of Cultivators' Cotton plainly showed that village sales were preferred to sales in the market mainly because of the disputes in the latter place and because of the many deductions in cash and kind. These deductions have now been defined in the various markets and growers will now know exactly what they are expected to pay.

MARKETING OF IMPROVED VARIETIES OF COTTON.

36. The Committee continued to supply information to the trade of the progress made in the establishment of new varieties of cotton introduced by the Provincial Agricultural Departments through the medium of its Technological Reports on spinning trials. The success of a new variety depends on the price received by the grower and it is essential for the successful extension of the variety that he should continue to obtain the relative premium of former years. The reports issued by the Technological Laboratory help to bring to the notice of the trade the capabilities of these new introductions, the quantity available and the markets where they can be

* Appendix III.

obtained. Several of the improved varieties reach the mill in a state of purity but many of them, though fetching a premium, are used to grade up the local cotton. The Committee attaches considerable importance to these spinning tests because they show the capabilities of the cotton in a pure state and it can almost be accepted as an axiom that no cotton will fetch its true price unless it reaches the consumer in this condition.

37. The Committee discontinued the practice during the year of sending to the Manchester, Liverpool and Bombay Cotton Exchanges type bales of those improved cottons which are now being grown in commercial quantities in India.

38. The Federation of Master Cotton Spinners' Associations asked the Committee for its co-operation with a view to improving the grades of Indian cotton and increasing the use of it in England (*a*) by setting up definite and reliable universal standards of grades or types of Indian cotton, (*b*) by setting up, in co-operation with Bombay, Karachi, etc., an official type of deferred delivery contract, and (*c*) to consider what joint action could be taken regarding the practice of mixing *desi* cotton with good types, particularly with Punjab-American. Through the courtesy of the Board of the East India Cotton Association *replicas* of the official standards of the Association for F.G.M.G. Bengals contract of M.G. Punjab and F.G.M.G. Broach contract of M.G. Punjab-American were prepared and sent to Manchester. It was also arranged to send boxes of Sind cotton when the East India Cotton Association prepare their official standards at the beginning of the cotton season. It was felt by the Committee that there should be no difficulty in selling on an extended contract in Lancashire and that any large exporting firm in Bombay or Karachi would be prepared to undertake such business. With regard to (*c*) the Federation was informed that the Committee, in co-operation with trade associations, Local Governments, etc., was giving its fullest consideration to the malpractice of mixing, and to the means whereby this malpractice might be checked.

COTTON MARKETING IN KARACHI.

39. The negotiations, mentioned in last year's report, between the Karachi Joint Cotton Committee and the East India Cotton Association regarding common standards in Bengals, Sind and Punjab-American cotton were successful and the Karachi Joint Cotton Committee agreed, as an experimental measure for one year, to lower their standard for Punjab-American cotton to 6/8″ and so bring it into conformity with the one used in Bombay.

MEANS TO PREVENT THE INTRODUCTION OF THE MEXICAN BOLL-WEEVIL.

40. With a view to prevent the introduction into India through imported American cotton of the most serious of all cotton pests, viz., the

Mexican cotton boll-weevil (*Anthonomus grandis*), the Government of India, at the instance of the Indian Central Cotton Committee, has restricted, since 1925, the import of American cotton into India to a single port, namely Bombay, and only after fumigation with hydrocyanic acid gas. The notification continued in force throughout the year under report during which time 10,942 bales were fumigated as against 67,531 bales fumigated during the previous year. This fall was the natural consequence of the comparative cheapness of Indian cotton during the year, as stated elsewhere in this report. The rebate of 8 annas a bale, which as stated in last year's report was recommended by the Committee, was sanctioned by the Government of India in March last, and claims on 91,429 bales fumigated between the 12th July 1927 and the 6th August 1928 were preferred and a total refund of Rs. 45,714-8-0 made. This year on account of the low imports it has not been possible to recommend any rebate. In September 1928 the Government of India passed orders agreeing to the previous recommendation of the Committee that the fee of Rs. 2 charged for the fumigation of American cotton sample parcels weighing less than 20 lbs. should be waived, and that henceforth they should be fumigated free of charge.

COTTON STATISTICS.

41. *Raw cotton trade statistics.*—As indicated in last year's report, the Government of India, on the recommendation of the Committee, re-instituted the compilation and publication of the import and export statistics relating to rail and river borne raw cotton into and from each trade block. These are published monthly as supplements to the *Indian Trade Journal*, and the first of this series is for the month of October 1928. The whole of India is divided into 61 trade blocks, and the imports and exports between each block are recorded in these returns. These statistics should prove of the greatest use both to the Cotton Trade and to the officers responsible for the preparation of cotton forecasts.

42. *Cotton forecasts.*—The All-India Supplementary Memorandum on the cotton crop of 1928-29, published by the Director-General of Commercial Intelligence and Statistics in May, contained this year the revised figures of area and yield for Bombay, Madras, Hyderabad and Baroda. No material change was reported to have taken place in the character of the crop in any of the remaining provinces and Mysore since the February forecast. The value of compiling a fifth cotton forecast in Bombay and Hyderabad was clearly demonstrated this year as both had to report substantial changes in area and yield.

43. *Cotton press returns.*—The efforts of the Committee to enlist the co-operation of Indian States, which have cotton pressing factories within their territories, to compile weekly cotton press returns, have been successful beyond all expectation. During the year under report thirty-one Indian States furnished such returns, and it is hoped that during the season 1929-30 a substantial addition to this number will be possible. As already indicated

in para 19, the portion of the total Indian cotton crop for which such statistics are not yet issued is very small, but until complete statistics are available to the authorities responsible for the compilation of cotton forecasts, one of the important uses of these figures, namely, that of checking the accuracy of the cotton forecasts, must remain imperfect. To give an example. For the fourth year in succession the Punjab and Sind show very high excesses of cotton pressed over the estimated crop, and because of the presence of neighbouring cotton-growing Indian States which do not issue the necessary statistics, it has not been possible to discover the sources of error which cause such huge discrepancies in the estimated yields nor to devise measures to prevent a recurrence of such errors. It has long been a standing complaint of the Cotton Trade that Government forecasts are usually under-estimated. The truth of this assertion is now amply borne out by the cotton press returns. During the season 1928-29 the cotton pressed in British India exceeded the estimated crop by 380,000 bales. In the Gujerat block alone the excess was 93,000 bales. In the two previous years the cotton pressed in the Baroda, Navsari, and Kadi districts of the Baroda State fell below the forecasted crop, and it was assumed that the shortage in these districts accounted for the excess in Gujerat. This year, however, these three districts of the Baroda State show an excess of 15,000 bales, so that it becomes necessary to look for the source of error elsewhere, unless it be that the damage caused to the crop by frost was over-estimated in both the tracts. In the Central Provinces the excess is larger than that found last year, the Nagpur block again being responsible for the major part of it. The United Provinces, as in previous years, have shown a deficit which is explained as due to local consumption. As pointed out above, the Sind and the Punjab forecasts are very badly out, the excesses of cotton pressed over the estimated crop being 78,000 bales on a 109,000-bale crop in Sind and 218,000 bales on a 521,000-bale crop in the Punjab. All this excess cannot be explained away as due to imports from neighbouring Indian States or to the utilization of the 400-lb. bale in the forecasts or to both. There appear to be other sources for this large recurring discrepancy which have yet to be discovered.

44. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for Indian mills of American cotton, the arrivals and the quantity at sea. In this connection the Committee's thanks are due to the importing firms of Bombay and to millowners for furnishing confidentially from time to time their purchases of American cotton.

45. *Cotton consumption.*—The compilation and publication of the monthly statements (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States, and (3) of loose cotton received in the mills in the major cotton-growing provinces was continued. Statistics of Indian cotton consumed in mills in British India are compiled from the statutory mill returns made under the Indian Cotton Cess Act, and these furnish the most reliable figures of such consumption. They also serve as a check on the voluntary returns collected by the International

Federation of Master Cotton Spinners' and Manufacturers' Associations. The second statement is compiled from voluntary returns furnished by the States of Hyderabad, Mysore, Baroda, Gwalior and Indore and from the yarn production in the other States. The statistics of loose cotton received direct by mills are complementary to the statistics of pressed cotton and between them they form the first actual enumeration of the crop.

COLLECTION AND SUPPLY OF INFORMATION.

46. As in past years a note on the progress made in the Provinces and States in the introduction of improved varieties of cotton was contributed to the Bombay Cotton Annual published by the East India Cotton Association. This note is given in Appendix IV. In addition, notes on the working of the Cotton Transport Act, the Cotton Ginning and Pressing Factories Act, and other information and statistics of general interest to the trade were also supplied.

47. During the year a system of circulating the more scientific and technical journals between the cotton research institutions financed by the Committee was introduced. This was devised to prevent the unnecessary duplication of the journals purchased out of the Committee's funds, and also to afford an opportunity to the *mofussil* research worker to peruse more literature of a more scientific nature than he otherwise would.

48. The Committee has again to record its thanks to those private and public institutions which maintain on their free mailing list the name of the Committee. In particular the Committee is indebted to the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, to the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to members.

PUBLICATIONS.

49. The following were published during the year :—

A note on the early history of cotton. (Technological Bulletins, Series B, No. 3.)

Ginning percentage and lint index of cotton in relation to the number of cotton fibres per seed ; the effect of environment on ginning percentage ; and the determination of unit fibre-weight. (Technological Bulletins, Series B, No. 4.)

Further tests on the effect of temperature and humidity on Cotton Spinning. (Technological Bulletins, Series A, No. 10.)

The effect of using either One Head or Two Heads of Drawing instead of Three Heads of Drawing in the Spinning Preparation for Spinning Tests. (Technological Bulletins, Series A, No. 11.)

Technological Reports on Standard Indian Cottons, 1929. (Technological Bulletins, Series A, No. 12.)

Technological Report on samples of Punjab-American and Mollisoni (Deshi) cottons grown in different parts of the Punjab in the season 1928-29. (Technological Bulletins, Series A, No. 13.)

The Technological Laboratory of the Indian Central Cotton Committee; a Brochure descriptive of the History, Work and Aims of the Laboratory.

Report on an investigation into the Finance and Marketing of cultivators' cotton in Middle Gujerat.

Report on an investigation into the Finance and Marketing of cultivators' cotton in Madras (Northerns and Westerns Tract).

Addendum to the Report on an investigation into the Finance and Marketing of cultivators' cotton in Khandesh.

Report on an investigation into the Finance and Marketing of cultivators' cotton in Sind.

General Report on the Eight Investigations into the Finance and Marketing of Cultivators' Cotton.

SECRETARY'S TOURS.

50. I paid visits to Simla, Lyallpur, Khanewal, Lahore, Hardwar, Cawnpore, Nagpur, Akola, Dhulia, Indore, Udaipur and Ajmer in connection with the work of the Committee, and Mr. Jenkins, as Deputy Secretary, visited Madras, Coimbatore, Tirupur, Bangalore, Dharwar and Hubli. When acting as Secretary Mr. Jenkins visited Dhulia, Jalgaon, Indore (three times), Poona, Pusa and Nasik.

FINANCIAL.

51. In Appendix VI will be found statements showing the Receipts and Expenditure and also the Balance Sheet for the year ending 31st March 1929. Receipts amounted to approximately Rs. 7,81,200 and expenditure to Rs. 6,70,000. The estimated expenditure was Rs. 8,55,000, the chief savings being under the Madras Pempheres and Physiological Scheme, Administration, Improvement of Cotton Marketing and working expenses of the Technological Laboratory. In the current year, receipts are estimated at Rs. 7,86,000 and expenditure at Rs. 8,31,100.

CHAPTER III.

RESEARCH.

52. One of the main functions of the Committee is to finance research into the growing, marketing and technology of cotton. The bulk of the funds for the Institute of Plant Industry at Indore is provided by the Committee. This is a central research institute for cotton and agricultural problems, particularly those connected with the crop grown on the black cotton soils of Central India. Grants-in-aid are also given to Provincial Departments of Agriculture for specific investigations into cotton problems. The Committee has also given grants to Local Governments for carrying out investigations into the finance and marketing of cultivators' cotton. Technological research is carried out in the Technological Laboratory in Bombay and is under the direct control of the Committee.

The Committee's policy has been to finance investigations of a general nature, leaving Provincial Departments of Agriculture to tackle those of purely local character. This policy has been closely followed except in the case of the Botanical Schemes which the Committee is financing in the principal cotton tracts. These schemes must of necessity be local in their character because of the diversity of climate and types of cotton all over India. Although much had been done in the past by Provincial Departments of Agriculture to improve the quality and yield of Indian cotton, the Committee felt that much more remained to be done, and as many of these Botanical Schemes as were put up by Provincial Governments were sanctioned. Improvement in yield and quality by selection and hybridization is the intention underlying all these Botanical Schemes, though some are carrying out fundamental research in addition. The schemes of an all-India nature are the Mycological, Entomological and Physiological ones which deal with problems common to the greater part of cotton-growing India, the elucidation of which should have fairly general application.

53. All Research Schemes are first approved by the Agricultural Research Sub-Committee which in the past has been composed mainly of the experts on the Committee. During the year, however, several representatives from trade organizations evinced such an interest in the agricultural research work that the Committee decided to enlarge the Sub-Committee by appointing two trade members to it. A general stock-taking of all the schemes was made by the Sub-Committee during the year and it was generally admitted they were on the right lines and that all but one should be continued with.

54. Two other decisions altering previous policy made by the Committee during the year may be mentioned here. It had always been accepted that the funds of the Committee should not be used for extension work, but at

the suggestion of one trade representative, the Committee reversed its previous policy and has now decided to assist Agricultural Departments in the wider distribution of improved varieties of cotton by the provision of staff or funds or in any other way. The other decision of equal importance is that the Committee will help local authorities to extend the results of schemes financed from the Committee's grants, as the practical value of any successful research depends on the results being widely broadcast and incorporated in general agricultural practice.

TECHNOLOGICAL LABORATORY.

55. The Report of the Director, Technological Laboratory, will be found in Chapter IV. Considerable progress was made during the year both in the Research Section and in the Spinning Laboratory and the number of samples tested reached the highest figure since the Laboratory was opened. The object of the Laboratory is to provide accurate spinning tests on Indian cottons in order to aid agricultural experts in coming to a decision with regard to the merits of new varieties and also to undertake research into fibre characters. Although the two branches are dealt with separately in the Director's report, the Spinning Laboratory and the Research Laboratory are interdependent as the work in the Research Laboratory is intended to determine the relationship between the various characters of a cotton and its value for spinning purposes. During the year the Laboratory tested 208 samples, of which 46 were for Agricultural Departments.

In addition to the work on new varieties, tests have been carried out for a number of years on what has been termed " Standard Cottons," which are those varieties of improved cottons now being grown in commercial quantities. These were originally taken up to provide a basis for comparing the new strains, but the results have proved of very great value to the trade and to Agricultural Departments. Much valuable information has already been collected on the variation of quality due to seasonal factors and it is hoped to arrive at some understanding of the causes of these fluctuations. Twenty-one standard cottons were tested and reported on during the year and the reports were issued in pamphlet form within a very short period after the receipt of the cotton. The trade was thus put into a position of judging the likely performance of a variety almost as soon as it came into the market. Tests were also carried out on samples of Punjab-American cotton containing different percentages of mixture of *desi* cotton, and it was decided to repeat the tests as the results showed promise of being valuable as a guide in the detection of the percentage of mixture.

56. An important departure from previous policy in connection with the Laboratory was decided on during the year, viz., that efforts should be made to utilize the Technological Laboratory more fully for testing trade samples without in any way sacrificing its value to the cotton breeders of Provincial Agricultural Departments. It was agreed that, as occasion permitted, a series of tests should be carried out on mixings of cotton of different

staples and that the results should be published for general information. It was also decided to carry out spinning tests on average samples of the commercial crop each year, if it can be done without detriment to the normal activities of the Laboratory. It was also decided to co-opt to the Technological Research Sub-Committee two members from each of the Bombay Millowners' Association, the Ahmedabad Millowners' Association and the East India Cotton Association to keep the Laboratory more in touch with trade requirements.

Seven bulletins were published during the year, summaries of which will be found in the Director's report. Extracts from the reviews which appeared in the leading textile journals are given in Appendix V.

Dr. Turner proceeded on leave for five months and 19 days from the 17th June and the Committee appointed Mr. Richardson, Spinning Master, to fill his place.

THE INDORE INSTITUTE OF PLANT INDUSTRY.

57. The Indore Institute was opened in 1924 though only four agricultural years are covered by the Director's annual report to be found in Appendix I. The Director has embodied the results achieved up to date and the work in progress in a book, published by the Oxford University Press, entitled "The Application of Science to Crop-Production." His report therefore deals mainly with administrative matters. Investigations into the botany, physiology and cytology of Indian cottons are in train and considerable progress has already been made. The States continue to display the same considerable interest in the Institute and three more joined during the year, viz., Rewa, Bundi and Jaipur, bringing the total to sixteen with an increase of Rs. 13,000 in annual contributions. Benefactions to the total value of Rs. 25,498 were received during 1928, details of which will be found in the Director's report. Three students of the Committee completed their training, two of whom obtained suitable appointments. One student took up an important appointment in Madras during his first year.

The Holkar State decided to give an intensive training at the Institute to the whole staff of tehsildars (33 in number) in batches of five so that they might become acquainted with the work in progress and carry the lessons learned to the villages in their charge.

Mr. Howard retired from service under the Government of India in December 1928 and the Committee re-employed him on a two-years' agreement from that date.

GRANTS-IN-AID.

58. In addition to the Central Institute at Indore, the Committee financed during the year 13 research schemes in the main cotton-growing

tracts of India, as follows :—

Madras	1—Botanical.
Bombay	5—2 Botanical, 1 Physiological, 1 Mycological and 1 Entomological.
Central Provinces	2—Botanical and Mycological.
United Provinces	1—Entomological.
Punjab	2—Botanical and Physiological, Entomological.
Sind	1—Physiological.
Hyderabad	1—Botanical.

The grants are given to permit the employment of staff and equipment for specific lines of work approved by the Committee. Land and buildings are provided by the Local Governments. All were sanctioned in the first place for a period of five years, and seven have been given an extension in order to permit them being carried to their proper conclusion. It has to be borne in mind that agricultural research is a long process and that results cannot be hurried. Even with straightforward selection it takes at least six years before tangible results can be expected. In July the Agricultural Research Sub-Committee went very carefully into each scheme and was able to recommend to the full Committee that all but one should be continued. The summaries below give a brief description of the schemes, their objects and the work accomplished.

BOTANICAL SCHEMES.

59. *Madras Herbaceum Scheme.*—Average annual grant Rs. 12,016 sanctioned for five years from 1923. Extended till September 1930.

The Agricultural Research Sub-Committee reviewed this scheme at its December meeting and recommended that it should be extended for a further period of two years to allow the further testing of the best of the strains evolved. The first stage of the scheme was the isolation, in pure lines, of the different strains of *G. herbaceum* which form the local mixture called *Uppam*. The second stage, now being carried out, is the testing of the strains in the field and in the spinning laboratory in order to determine whether any is better than the local mixture in point of yield or quality or both. The third stage, if sanctioned, is the crossing of certain of these strains with outside strains in order to obtain one better than its progenitors. One strain has given results as good as the local mixture in yield with a marked advance as regards quality. Five more strains have been isolated for testing and two show indications of being higher yielders than the one already evolved. The second stage will be completed when these five strains have been fully tested. The problem in this area is a difficult one. The rainfall is light and somewhat precarious. There are 800,000 acres of rain-fed cotton, mainly *Karunganni* and *Uppam*. In good years *Karunganni* is a much better

Cotton Research Laboratory, Lyallpur.

yielder than *Uppam* while in bad years the position is reversed. The cultivator tries to meet the situation by growing either a mixed crop or the two varieties in alternate years. The *Karunganni* strains being distributed by the Agricultural Department are capable of being spun to 26s standard warp and the *Uppam* local mixture to 14s only. The intention is to level up the difference between these two cottons by producing a high-yielding strain capable of spinning 20s or more which can be grown in place of the local mixture. This may possibly be achieved only by hybridization.

60. *Central Provinces and Berar Research Scheme.*—Average annual grant Rs. 33,380. Present grant Rs. 41,689. Started in 1923 and extended for a further five years from April 1929, subject to review at the end of three years.

The objects of the scheme are (1) to obtain higher yielding and better quality cottons, immune to wilt disease, for the Central Provinces and Berar, (2) to study the causes of the low yields of cotton in Berar, (3) physiological work on the cotton plant, (4) the purification by selection of the Chanda cold season *Bani* cotton, of which about 10,000 bales are produced annually. The work of obtaining pure strains of the various types of Indian cotton had already been taken in hand by the Cotton Botanist before the Committee made a grant to the Central Provinces Government, so that a considerable amount of time has been saved. This is the first of the Committee's schemes to bear fruit and the new cotton evolved is now being taken rapidly by the cultivators. Dr. Youngman decided to distribute a strain of *Verum* which was found to be wilt-resistant even on land where '*Roseum*' and other cottons will not grow, and which has a lint far superior in spinning qualities to *Roseum*, the premium for which more than compensates the grower for a somewhat lower yield. An enormous demand has sprung up for the seed and 460,000 lbs. were sown this year, covering an area of 35,000 acres. Last year the lint fetched Rs. 67 a *khandy* on *Broach*. *Oomras* is usually quoted at about Rs. 30-35 off *Broach*, so that the new variety obtained Rs. 100 a *khandy* over the local growth. The Central Provinces Government has placed a sum of 2 lakhs of rupees at the disposal of the Director of Agriculture for advances to cultivators with a view to obtaining an adequate supply of seed and in order to market the cotton in a pure state. Progress has also been made on the Akola Farm in the rotation and manurial experiments devised to combat the low yields of cotton, while the study of the relationship of the crop to soil moisture is being continued.

61. *Punjab Botanical Research Scheme.*—Average annual grant Rs. 46,750 for five years. Commenced in 1925.

This scheme is in its fifth year and at the July meeting the Agricultural Research Sub-Committee went very fully into the work accomplished and recommended an extension for a further period of five years from 1930. The primary object is the improvement of cotton and cotton growing in the Punjab by means of botanical investigations. Though started only four

years ago, Mr. Trought has obtained a type which is a distinct improvement over the 4F variety at present being grown. This type is still undergoing field tests and has been grown in an area of 8 acres in addition. It equals 289F in yield but is not quite equal to it in staple length though it is distinctly better than 4F in this respect. Its great advantage over 289F is in its earliness. It does not appear to be affected to the same degree as other cottons by the conditions which produce the periodical failures of the Punjab-American crop. Another important part of the work under this scheme is an investigation into the causes of the frequent failures of Punjab-American cotton. Extensive records on the growth and development of the plant have been accumulated and though they do not yet point definitely to any particular cause of the failure, they are of considerable value in tracing the history of the crop through the season so that in time it is hoped to correlate these records with the type of crop obtained and arrive at conclusions as to the cause of the failures. Pending the production and distribution of new cottons by selection and breeding, roguing of commercial crops on the farms of certain estates is also done on a large scale in order to maintain a nucleus of pure seed for propagation. A *desi* type (*G. sanguineum*) taken over by Mr. Trought from the Botanical Section amongst others on his arrival has proved to be a better yielder than any of the others and is now being multiplied up for distribution by the British Cotton Growing Association at Khanewal. Work is also being carried out on the water requirements of the crop and much valuable information is being collected.

62. *Dharwar Cotton Breeding Scheme on Upland Cotton.*—Average annual grant Rs. 12,083. Commenced in 1923, extended in 1928.

The object of this scheme is to improve the staple of Upland cotton by crossing it with Sea Island. The Dharwar Upland cotton is the only American cotton which has survived the many attempts to introduce exotics into the non-irrigated cotton tracts of India. The Agricultural Department has already replaced the old mixture by a pure type Gadag 1—which is now grown in a large area around Gadag. The scheme was meant to improve on this Gadag 1 variety. Two strains have been retained, the better of which gives an improved staple and a higher ginning percentage than Gadag 1, but the spinning report of 1927 stated that it showed no superiority over standard Gadag 1 in staple or strength and was inferior in the number of counts to which it could be spun. The Agricultural Research Sub-Committee decided at the July meeting that as a research of the Indian Central Cotton Committee the scheme should be closed down and that the selection which shows some chance of success should be handed over to the Cotton Breeder, Dharwar, for further test.

63. *Khandesh Cotton Breeding Scheme.*—Average annual grant for five years Rs. 5,000. Started in 1925.

A grant was given for the employment of extra staff to test in replicated field and large-scale trials some Bani-Comilla crosses made by the Agricultural

Department some years ago. Dhulia I is the main result. This cotton for two years has yielded slightly better than N. R. (the cotton in general cultivation), has a staple of $\frac{5}{8}$" to $\frac{6}{8}$" compared with $\frac{4}{8}$" of N. R., a ginning percentage of 38 to 39 against 35 to 36 of N. R. and i capable of spinning 18s to 20s against 8s to 10s of N. R. The cotton fetched Rs. 2 to 3 per *maund* over that of N. R. while the lint obtained a premium of Rs. 15—30 more than N. R. per *candy* of 784 lbs. 961 bales were sold in Khandesh markets through the agency of the Agricultural Department; 3,000 acres were under the variety last year and this figure will probably rise to 20,000 acres in the coming season. Further crossing work is being done between this type and two others, Dhulia II which was rejected because of its susceptibility to wilt, and BXXI, a poor yielder but with a lint which spins 30s.

64. *Hyderabad Botanical Research Scheme.*—Sanctioned for five years from May 1929. Average annual grant Rs. 24,500.

This scheme was sanctioned during the year and the following programme of work is being taken in hand :—

(1) Botanical study of the mixture now grown under the name *Gaorani.* (2) The production of a high-ginning, prolific and uniform type of good *Gaorani* strain. (3) Study of the development of the cotton plant as grown under the conditions pertaining at Parbhani. (4) Preliminary study of the effect of a number of cultural factors on plant development and yield. (5) Preliminary trial of a number of medium or long staple Upland American varieties to determine their suitability as unirrigated crops in the *Gaorani* tract and as irrigated crops in areas where canal irrigation is being made available. (6) Study of insect pests and diseases of cotton.

COTTON DISEASES.

65. Wilt is the commonest disease of cotton in India and the loss of crop to the grower is considerable. The Committee therefore agreed in 1923 to give grants to the Governments of Bombay and the Central Provinces in order that a thorough investigation might be made into the cause of the disease and for remedial measures to be devised to check it.

66. *Dharwar Cotton Wilt Research Scheme.*—Average annual grant Rs. 12,083 for five years. Commenced in 1923, extended in 1928.

The Agricultural Research Sub-Committee in 1928, when reviewing the progress achieved at the end of five years during which the scheme had been in operation, decided that an extension should be given for a further period of five years subject to revision at the end of three years in order that the staff might concentrate on the production and testing of wilt-resistant strains, which they considered was the most promising line of attack. This did not debar the workers from investigating other methods likely to lead to a solution of the problem. The Cotton Breeder has been able to produce

certain races highly resistant to wilt and one of these (hybrid between Dharwar 1 and Dharwar 2) meets all the requirements of the trade as well as having a higher ginning percentage and being a somewhat heavier cropper than Dharwar 1—the susceptible variety which it is hoped to oust. Another cross (Dharwar 1 and Wagale) also shows promise, for besides its resistance to wilt, it has a good ginning percentage, a long staple and a white colour. It will now be tested for yield. A series of pot experiments confirmed the findings of previous years that low temperatures are conducive to high mortality from wilt and these experiments will be repeated in conjunction with a series of laboratory experiments on the effect of temperature on wilt. Field experiments on (1) effect of heavy manuring, (2) ridge and flat and seasonal sowings, and (3) the effect of hot weather ploughings all gave inconclusive results.

67. *Central Provinces Wilt Scheme.*—Average annual grant Rs. 5,133. Started in 1923; closed down March 1929.

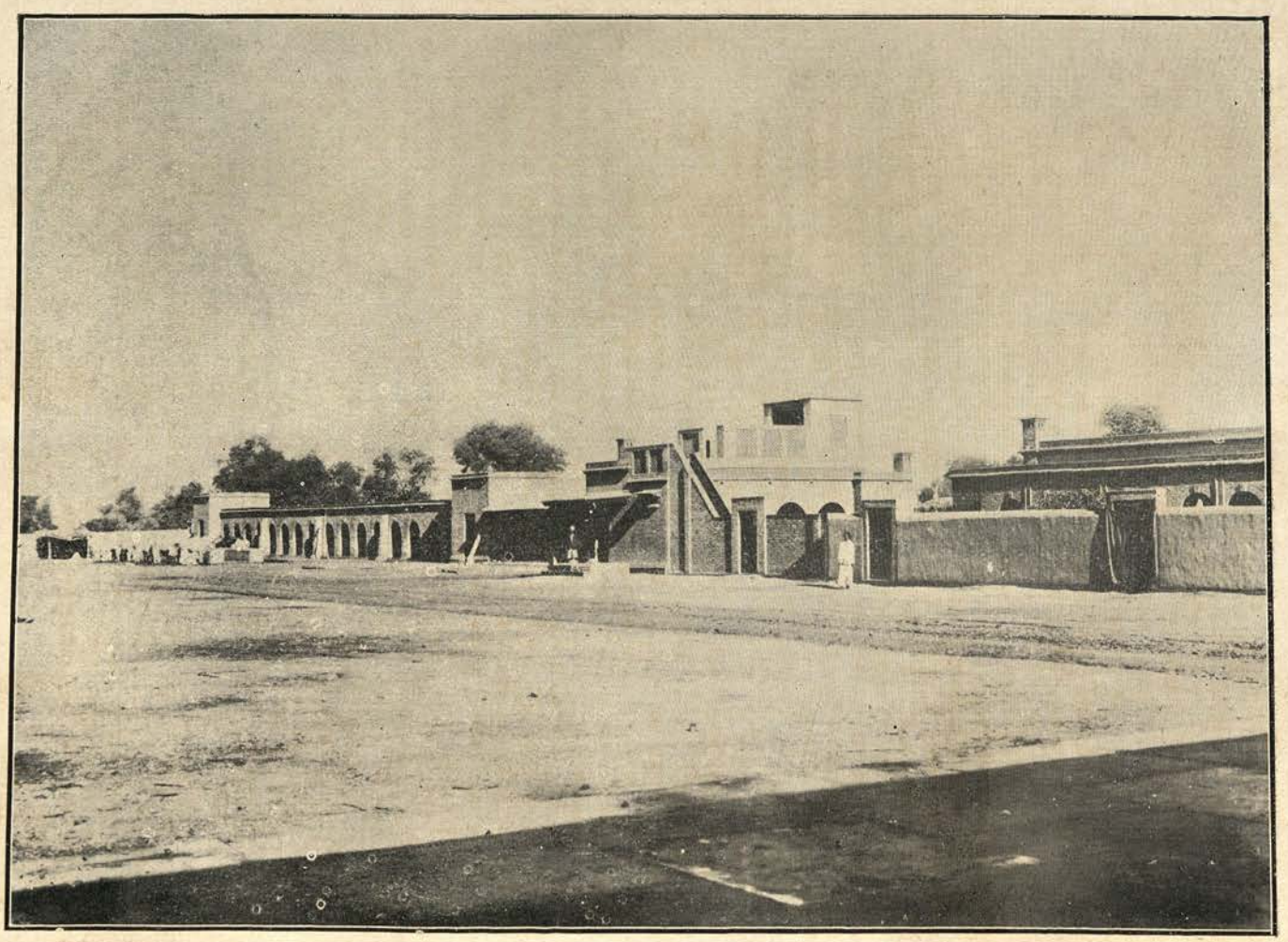
As mentioned in last year's report, the Agricultural Research Sub-Committee decided to close down its grant in connection with this scheme at the end of the five-year period, which occurred in the year under report. Mr. J. F. Dastur, Mycologist to Government, Central Provinces, agreed to work on a physiological aspect of the wilt problem and he came to the conclusion that soil factors and not any pathogenic organism were responsible for the conditions known as wilt. Mr. Dastur submitted a final report on his work during the year.

COTTON ENTOMOLOGY.

68. Three entomological schemes are being financed by the Committee, two into the Pink Boll-worm (*Platyedra gossypiella*) and one into the Earias Boll-worm (*Earias fabia* and *Earias insulana*).

69. *United Provinces.*—Total capital grant Rs. 54,000. Average annual grant Rs. 11,200. Commenced in 1923, extended till May 1930.

The work carried out during the year has most clearly confirmed the findings of previous years, viz., if only that seed is sown which has been heat-treated in order to kill the *larvæ* of the moth and if all sources of re-infection are shut off, the resultant crop will give an increased yield of not less than 25 per cent. per acre and the lint will fetch a much better price in the market due to the absence of stain. Sufficient evidence has now been obtained to support the previously expressed opinion that narrow protective belts are of no practical value in Pink boll-worm control, because the flight range of the moth is very high. In the isolated Hardwar area, a four-mile protective belt made a practically effective barrier till late in the season. Large field-scale operations have been laid down in Antrauli Tahsil, Aligarh District, for the present season in order to determine the extent to which a Pink boll-worm-free belt in a continuous cotton area will protect the crop beyond it.



Cotton Research Farm, Risalawala, Lyallpur.

In the experiment laid down, only a small area in the centre of the 340 square miles is expected to be free from attack even if the heat treatment of the seed has been carried out satisfactorily. It is hoped in a future year to carry out a bigger scheme, in co-operation with the ginning industry, to take in the whole of Aligarh District and adjoining tahsils so as to provide an experimental area of over 4,000 square miles.

70. *Punjab.*—Initial grant Rs. 6,000. Average annual grant Rs. 15,533. Commenced in 1926.

This investigation was undertaken to throw some light on the difference of boll-worm attack in the South-East Punjab and in the Canal Colonies. In the former tract, the Pink boll-worm is a serious pest while in the latter, the main cotton-growing area in the Punjab, the damage done is never so high as to call for control measures. Further information was gained on the climatic conditions in relation to the distribution of the Pink boll-worm in the Punjab. It was found that egg hatching was not successful at temperatures above 40° C. and that a temperature of 25° C. was sufficient to retard oviposition. Some valuable information on the main sources of infection was obtained. Stored cotton seed appears to be the chief danger, while heaps of low-grade cotton and *patti* in ginning factories form an important source of re-infection. Exposure of the seed to the heat of the sun for one day during April to June killed all the contained worms. In March the sun temperature was not sufficiently strong to kill off all the *larvæ*. This is a simple and practical method of control and further work on these lines is being continued. Another line of research under this scheme is to discover how far climatic conditions are changing in the Punjab by the extension of irrigation and whether the Pink boll-worm will be able to adapt itself to these changed conditions.

71. *The Earias Boll-worm Scheme—Surat.*—Average annual grant Rs. 16,239. Commenced in 1923; extended in 1928 till September 1930.

This scheme is closely connected with the Surat Physiological Scheme. All the preliminary work has been carried out and the stage reached of testing remedial measures devised to combat the incidence of the pest. Valuable information was obtained on the increased yield of *kapas* from boll-worm-free plants and the effect of soil mulching on the pupation of the worm under field conditions. Work with different insecticides was continued and the economic aspect of such treatments is now being investigated. An extensive study of the carry-over from one season to another has shown that an effective clearing up of the cotton fields after harvest would have a marked effect on the number of boll-worms in the next year's crop. Efforts are being made to design a small implement to enable cultivators to uproot their cotton stalks with ease and without much extra cost.

COTTON PHYSIOLOGY.

72. *Surat Research Scheme.*—Average annual grant Rs. 29,145. Commenced in 1923. Extended in 1928 for five years subject to revision in three years.

The object of this scheme is to determine the causes of shedding of cotton buds, flowers and bolls and to devise measures to reduce the loss. A stage has been reached in this research where it has been possible to eliminate certain factors, e.g., fungi and bacteria, as being responsible. The controlling factor appears to be the supply of nitrogen and the competition between different parts of the plant for the available plant food. Nitrogen has been given in varying amounts, at varying times and with varying amounts of water, and it has been found possible to obtain a plant that produces a larger number of buds which ripen into bolls. On small-scale experiments, the application of 50 lbs. nitrogen per acre in the form of $NaNO_3$ has given an increase of 60 per cent. *kapas.* Both small and large scale experiments are now being carried out to test this, as well as accurate chemical analysis of plants and soil. Work is also being continued on the heritability of boll shedding and the search for strains of cotton with a capacity for higher development of bolls from buds.

73. *Madras Pempheres and Physiological Scheme.*—Average annual grant Rs. 55,000.

The object of this scheme is to investigate methods of control of the Cotton Stem Weevil (*P. affinis*) which shows signs of becoming a major pest in Madras and other parts of India. Certain strains in Madras show a marked resistance to attack and power of recovery and this offers up a most promising line of investigation. In addition, the continuation of the work on bud, flower and boll shedding commenced by the Cotton Specialist will be carried on. The scheme has not been started though it was sanctioned three years ago, owing to the difficulty of obtaining a Physiological Botanist. The Indian Central Cotton Committee at its last meeting approved of revised proposals submitted by the Director of Agriculture and it is hoped that the work will be taken in hand at an early date. The main points in the proposals were (1) that a commencement should be made with the preliminary work under the Cotton Specialist, Coimbatore, (2) that two Indian officers selected from the Madras Agricultural Department should be specially trained with the object of eventually occupying the post of Physiological Botanist and Bio-Chemist under the scheme, (3) the post of Physiological Botanist should be re-advertised on a higher rate of pay in order to attract the services of a first-class botanist.

74. *Sind Research Scheme.*—Average annual grant Rs. 20,000. Commenced July 1927.

The object of this scheme is to investigate certain problems connected with the water requirements, sowing dates and the general physiology of the cotton plant under perennial irrigation. This work is being carried out in

anticipation of the change-over in Sind from inundation to perennial canal irrigation under the Lloyd Barrage Project. The question of cotton growing in Sind is a very important one. The chief obstacle in the past to the growing of long-staple cotton in Sind was the precarious and short water-supply. The supply of perennial water will alter the whole agricultural practice of the Province and will give a chance to Egyptian and American varieties. Experiments have shown that the long-staple exotics fall behind the more hardy short-staple cottons in yield and the Agricultural Department is concentrating in breeding a hardy and prolific strain of long-staple cotton by selection, acclimatization and hybridization with the hardy 4F Punjab variety. The physiological part of the work is being financed by the Indian Central Cotton Committee.

75. The Balance Sheet in Appendix VI shows till 31st March 1929 the total amount spent by the Committee on research, with the details under each scheme. In Appendix VII will be found the amount spent on apparatus and equipment bought under provincial schemes and which remain the property of the Committee.

RESEARCH STUDENTS.

76. The whole subject of the Committee's scholarships was reviewed during the year by a Special Sub-Committee appointed for the purpose. It was agreed that the results achieved had fully justified the institution of this branch of the Committee's activities and that no reduction in the standard of scholars admitted should be considered. It was decided to maintain a closer *liaison* between the Committee and Provincial Universities and to include in the awards graduates of Agricultural Colleges and suitable applicants with degrees in pure science. It was also decided to fix the minimum value of the Committee's scholarships at Rs. 100 per mensem in the first year and Rs. 125 p.m. in the second year but that the Selection Sub-Committee should be given full discretion to award higher scholarships in special cases. In view of this discretion given to the Sub-Committee, it was decided to discontinue the granting of senior research scholarships.

The grant of these scholarships has allowed the Committee to train up a cadre of highly trained scientific workers in all branches of the crop. The holders are placed under the guidance of experienced investigators working on the Committee's schemes or at the Institute in Indore. Many have been absorbed by the Committee and others have been given appointments under the Provincial Departments of Agriculture. Rs. 1,63,713 have been spent under this head in the six years ending 31st August 1929. Scholarships are normally for a period of two years, but frequently extensions are given to allow a worker to finish a piece of work on which he is engaged.

Forty-two research students have been given scholarships of whom eight are still under training. Twenty-two of those who have completed their training have been taken on the Committee's staff or have joined Provincial and State Agricultural Departments. Four resigned before completion of their period of training. Details of all students trained will be found in Appendix IX.

J. H. RITCHIE.

CHAPTER IV.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1928-29.

THE report is divided into four sections :—

I. Spinning Laboratory.

II. Research Laboratory.

III. Publications.

IV. General.

I. SPINNING LABORATORY.

During the year under review (1st September 1928—31st August 1929) the Spinning Laboratory has been fully employed. During the year 208 samples were received, of these 170 were for complete spinning tests. The corresponding figures for the year 1927-28 were 133 samples of which 105 were for complete spinning tests. During the present year 21 Spinning Test Reports (Nos. 68-88) and 7 Fibre Test Reports (Nos. 9-14) have been issued to the various Agricultural Departments as compared with 22 Spinning Test Reports (Nos. 46-67) and one Fibre Test Report (No. 8) in the year 1927-28. Two Yarn Test Reports also were issued during the present year. The following table shows in summary form the distribution of the samples tested in each of the five years during which the Laboratory has been in operation:—

Sample Distribution List.

Provinces.	Samples.						Lots.						Yarn Spun.					
	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	Totals 1924-29.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	Totals 1924-29.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	Totals 1924-29.
Bombay	18	26	22	22	30	118	36	52	44	44	72	248	103	152	132	132	144	663
Punjab	14	1	..	..	41	56	26	4	..	..	81	111	106	14	..	..	248	368
United Provinces	7	..	6	11	9	33	14	..	12	22	18	66	27	..	36	66	54	183
Madras	2	19	48	25	31	125	4	38	96	50	62	250	12	108	266	150	186	722
Central Provinces	2	..	3	2	2	9	3	..	6	4	4	17	8	..	18	12	12	50
Miscellaneous	3	11	..	6	6	26	3	22	..	12	9	46	3	58	..	36	27	124
Totals ..	46	57	79	66	119	367	86	116	158	132	246	738	259	332	452	396	671	2,110
Standard Cotton Tests ..	8	54	49	64	36	211	34	176	142	178	64	594	95	514	423	447	309	1,788
Total Tests ..	54	111	128	130	155	578	120	292	300	310	310	1,332	354	846	875	843	980	3,898

Note.—Each sample of cotton submitted for test is normally divided into two lots, each of which is then spun into three different types of yarn.

The following is a list of standard cottons referred to in the foregoing table on page 35; the figures in brackets after the name of each cotton show the season for which the cotton was first tested as a standard :—

Bombay Standard Cottons.

1. Dharwar 1 (Kumpta) (1923-24).
2. Gadag 1 (Dharwar-American) (1923-24).
3. Surat 1027 A.L.F. (1923-24).
4. Wagad 4 (1925-26).
5. Wagad 8 (1925-26).

Punjab Standard Cottons.

6. Punjab-American 4F (1924-25).
7. Punjab-American 285F (1923-24).
8. Punjab-American 289F (1924-25).
9. Mollisoni (Punjab *desi*) (1925-26).

United Provinces Standard Cottons.

10. Aligarh A. 19 (1924-25).
11. Cawnpore K. 22 (1924-25).
12. Bundelkhand J.N. 1 (1924-25).
13. Cawnpore-American C.A. 9 (1924-25).

Central Provinces Standard Cotton.

14. Verum 262 (1926-27).

Hyderabad Standard Cotton.

15. Umri Bani (1924-25).

Madras Standard Cottons.

16. Coimbatore Co. 1 (Cambodia 295) (1923-24).
17. Coimbatore Co. 2 (Cambodia 440) (1924-25).
18. Nandyal 14 (Sircar 14) (1923-24).
19. Hagari 1 (1924-25).
20. Hagari 25 (Sircar 25) (1923-24).
21. Karungani C7 (1924-25).

American Cottons.

22. Mississippi (1923-24).
23. Memphis (1925-26).
24. Texas (1923-24).

As a general rule, 50 lea tests, 100 single thread tests and 100 twist tests are made on each type of yarn spun from a non-standard cotton, and 50 lea tests, 200 single thread tests, and 100 to 200 twist tests are made on each type of yarn spun from a standard cotton; it follows therefore that the testing of the yarns spun in 1924-25 involved about 170,000 individual yarn-tests whereas for the yarns spun in each of the years 1925-26, 1926-27 and

1927-28, the total number of tests required was nearly half a million. Thus it will be seen that the Spinning Laboratory and the Testing Laboratory attained practically their maximum capacity in 1925-26.

Tests for Agricultural Departments.—The following is a statement of cottons tested for the various Agricultural Officers :—

BOMBAY.

(1) *Special Cotton Mycologist, Dharwar :*—Four samples, (*i*) two being Gadag I (a pure strain of the Upland type) grown in different localities, and (*ii*) a cross between the Gadag I and Sea Island, also grown in the same two localities.

(2) *Cotton Breeder, South Gujerat, Surat :*—Nine samples in all : five in No. 1 lot of which four different strains were grown on the Surat Farm for comparison with the fifth standard 1027 A.L.F. ; No. 2 lot being four Broach samples of which three were frost-affected.

(3) *Cotton Breeder, North Gujerat, Viramgam :*—Four samples, one being a new type and one a local, both being compared with the two standard Wagads.

(4) *Cotton. Physiologist, Surat :*—Four samples, two being frost-affected and two for comparison in connection with a test for boll retention.

(5) *Superintendent, Government Farm, Jalgaon :*—Three samples, two of which were pure strains under test for yield.

(6) *Cotton Overseer, Amalner :*—One sample of a comparatively new strain of Dhulia I.

(7) *District Cotton Overseer, Hubli :*—One sample of a new hybrid wilt-resistant for introduction in place of Dharwar I.

UNITED PROVINCES.

(1) *Assistant Economic Botanist, Cawnpore :*—Nine samples covering six different types of which three were pure types compared with the local Cawnpore cotton. Of the three pure types one was grown in three different districts and one was grown in two different districts.

MADRAS.

(1) *Cotton Specialist, Coimbatore :*—Two samples, one being a cross between N. 14 and *G. cernuum* for comparison with the newly developed standard Co. 2.

(2) *Cotton Assistant, Guntur :*—Two samples of Cocanada cottons one the original local and a pure line selection from it for comparison.

(3) *Manager, Government Experimental Station, Hagari :*—Four samples, two being new types compared with the two Hagari standard cottons.

(4) *Assistant Cotton Specialist, Nandyal :*—Two samples, one being a new strain of Nandyal compared with the standard Nandyal N. 14.

CENTRAL PROVINCES.

(1) *Superintendent, Government Farm, Akola :*—One sample of standard Verum 262.

MISCELLANEOUS.

(1) *Chief Commissioner of Port Blair :*—One sample of Sea Island grown in the Andamans from seed supplied by the Indian Central Cotton Committee.

The cottons which have been chosen as standard Indian cottons are those more or less recent Agricultural Department selections which have been introduced into cultivation on a commercial scale. The work on these standard cottons is of importance from several points of view. In the first place, it furnishes the necessary standards by which to judge new cottons; secondly, it provides Agricultural Departments not only with information which they did not previously possess of the capacities of the cottons but also with annual test-results showing to what extent quality has varied from that of previous seasons; thirdly, it provides the cotton trade with very valuable information which has a definite bearing on the marketing values of these cottons. Furthermore, through the combined work in the Spinning and Research Laboratories, the results of spinning tests and fibre measurements are being accumulated for various cottons, and it is by the investigation of these results that it is hoped to solve the problem of their inter-relationship.

Results for the Season 1928-29.—The latest (1929) edition of the " Technological Reports on Standard Indian Cottons " was published in May 1929, and includes the results of the tests on the standard cottons of the six seasons 1923-29. In order that the reports might have the utmost possible utility, the report on each staple cotton grown in appreciable quantity was also published separately as soon as possible after the receipt of the cotton in the

Laboratory usually within a fortnight thereof. These separate reports were issued on the following cottons :—

Technological Circular No.	Title.	Date of Publication.
12	Technological Report on Verum 262, 1928-29	November 1928.
13	Technological Report on Punjab-American 4F, 1928-29	December 1928.
14	Technological Report on Punjab-American 289F, 1928-29. ..	December 1928.
15	Technological Report on Umri Bani, 1928-29	December 1928.
16	Technological Report on Surat 1027 A.L.F., 1928-29	March 1929.
17	Technological Report on Cambodia Co. 1 (295), 1928-29	April 1929.
18	Technological Report on Dharwar 1, 1928-29	April 1929.

As in former editions of " Technological Reports, " Agricultural Details, Grader's Reports, Fibre Particulars, Spinning Test Reports, and Remarks are given for the eighteen standard Indian cottons which have been the subject of reports in previous years. The most important new feature is the inclusion of the results for three new standard cottons, viz., Verum 262, Cambodia Co. 2, and Hagari 1, which have been developed during the period in which the Technological Laboratory has been at work. Verum 262 is being grown in Central Provinces and Berar in tracts where hitherto the main cotton crop has been of a short and harsh cotton, suitable only for about 8s count ; but Verum 262 is a good-stapled and soft cotton capable of spinning from 20s-24s warp ; moreover, it is a good wilt-resister, so that on wilt-affected land, of which there is so much in Berar, it yields much more heavily than the coarse cotton, which is very susceptible to wilt. The case for the two Madras cottons, Combodia Co. 2 and Hagari 1, is rather different, as these are being spread in tracts which already grow very similar cottons, Cambodia Co. 1 and Hagari 25 respectively. It appears that Cambodia Co. 2 is hardly as good a cotton as Cambodia Co. 1, but as it yields much more heavily and is a better resister of the stem-weevil and black arm, it is much more profitable to the grower. The difference between Hagari 1 and

Hagari 25 appears to be still less; Hagari 1 has given much the same spinning test results as Hagari 25, but it has a higher ginning percentage, and appears to give a slightly higher yield.

An addition has been made to the Agricultural Details section of each report, with a view to conveying a rough idea of some important characteristics of the plant, viz., the spacing of the plants, the number of bolls per plant and seeds per boll, the weight of a single seed and the weight of lint per seed, together with the ginning percentage previously given.

A short section has been added to the Introductory note with a view to giving some idea of the distribution and character of the Indian cotton crop according to trade descriptions.

The increase of the number of seasons for which the tests are included has this year necessitated considerable changes in the presentation of the results for each cotton. Chief among these is that, whereas the tables of spinning test results formerly showed the results for each of the duplicate lots into which each sample of cotton is spun, in the present edition only the mean values for each pair of lots are included, except in the case of the 1928-29 season; further, the results in different seasons for any one count are now given in successive lines so as to facilitate the examination of seasonal variation. Other changes are: the Spinning Master's yarn examination reports are not now given separately but are included in suitable columns in the tables of spinning test results; and the results obtained by the old method of twist-testing have now been omitted as experience with the new method has shown them to be quite unreliable. Difficulties have also arisen in showing the fibre-length distributions for successive seasons in a single diagram; consequently, the plan has now been adopted of giving only the results for each cotton of 1928-29 compared with the average result for the same cotton for all the previous seasons in which it has been tested.

In view of the apparent anomaly presented by the values of the fibre-lengths of Punjab-American 285F and Cambodia Co. 1 in 1923-24, the original samples of these cottons have been subjected to re-tests, and certain corrections have accordingly become necessary in these values. Slight alterations have also been made to the figures given in previous editions for the fibre-weights and fibre-strengths, as a consequence of all values now being given as at 70 per cent. relative humidity.

In former editions a section of the general discussion of results was devoted to the relation between fibre-properties and spinning value; this section has now been omitted as the subject is being more fully dealt with in a separate bulletin.

Punjab cottons.—A number of samples of Punjab-American and Mollisoni cottons have this season been received from various parts of the

Punjab, and in one or two instances have given striking differences according to the place of growth. A Technological Report has therefore been prepared giving the results in some detail, and also a short discussion of them, and has been published as Technological Bulletin, Series A, No. 13.

Blow-room tests.—Considerable progress has been made with the tests on blow-room loss and card-room loss of certain commercial standards kindly supplied by the East India Cotton Association. Two bales of Karunganni only remain to be tested in order to complete this series.

High drafts.—In accordance with the decision of the Committee, arrangements have been completed for testing three systems of high draft, viz., Casablancas system (apron system) ; the Ingoldstadt system (a three-line bottom-roller system) ; and Tweedales and Smalley's system (a four-line roller system). The R. H. side of No. 2 Ring Frame has already been converted to the Casablanca system ; whilst the L. H. side has recently been converted to the Ingoldstadt system. One side of No. 1 Ring Frame will be changed to the Tweedales and Smalley's 4-roller system when the frame is available on the completion of the present supply of Agricultural samples. The comparative tests on high drafting will then be carried out simultaneously.

Limit-spinning tests.—Some misunderstanding has occasionally been caused by the references in the reports on the standard cottons, to the highest standard warp counts for which any given cotton is suitable, although it is clearly pointed out in " Technological Reports " that the count in question is simply the highest count at which the cotton can be spun, with a definite twist factor, to yield yarn of a certain strength. When the standards were originally adopted it was pointed out that these were merely tentative, and it has always been intended to investigate the possibilities of the standard cottons in much higher counts than those in which they are normally spun at the Laboratory. A beginning has been made in the spinning of Cambodia Co. 1 (295). Although this cotton on the scale adopted is adjudged suitable for warp counts up to 36s, it has actually been found possible to spin it to as high as 70s counts from single roving. However, the number of yarn breaks in this case were far too numerous to permit of the spinning being economical at this limit, and the highest economic limit has been found to be 52s with the twist constant 4 (28·89 turns per inch), and 56s with the twist constant $4\frac{1}{2}$ (31·47 turns per inch). It is intended to continue this " Limit-spinning tests " series on five other standard cottons, viz., Surat 1027 A.L.F., Mollisoni, Punjab-American 289F, Bundelkhand J. N. 1 and Hagari 25. The six cottons comprising this series cover a wide range of spinning quality of cotton as well as of district of growth and botanical species.

Mixture tests.—Another test recently carried out at the Technologica Laboratory, and which is of vital interest to the Cotton Trade generally, concerns the prevalent practice of the mixing of inferior class cotton with the better stapled qualities. This test had particular reference to the mixing of

the short harsh stapled *desi* (Mollisoni) with either of the two stapled Punjab-American cottons, viz., 4F and 289F. The Cotton Research Botanist of Lyallpur kindly supplied for this test, thirteen samples in all; of which three samples were pure cottons, namely, Mollisoni, Punjab-American 4F, and Punjab-American 289F. Five of the samples were mixtures of the Mollisoni with 4F previously prepared in different known percentages of each cotton, and the remaining five samples were similarly prepared mixtures of five different percentages of Mollisoni with the 289F.

The results of the spinning tests showed a very definite relationship between the highest standard count and the percentage of the mixture. It is hoped to publish the results of this test in the form of a Technological Bulletin in due course.

General tests.—A test of more or less general interest was recently carried out in the Technological Laboratory on two samples of Sea Island cotton of first and second generation grown in the Andaman Islands from seed supplied by the Indian Central Cotton Committee. For comparison, the lint from each sample was spun into 8os carded yarn and 1oos combed yarn. The results of the test showed that no apparent deterioration had taken place between the first and second generation and that the cotton was suitable for a 100's combed yarn of good average quality.

II. RESEARCH LABORATORY.

Fibre-Testing Section.—It is a function of this section to make fibre tests on all the cottons which are subjected to spinning tests, and most of the time of the members of the staff working in this section is occupied in this way. In some cases, however, cottons are received in quantity which is insufficient for spinning tests, and in such cases it is the custom to make fibre tests only. The routine tests comprise the determination of fibre-length and fibre-length distribution, the fibre-weight per inch, the fibre-strength by both the O'Neill method and the Balls Magazine Hair Tester, the fibre-rigidity, the fibre-width, and the number of convolutions per inch. Many tests of this kind have now been made on the standard Indian cottons of seasons previous to 1926, to supplement the complete series already made on the cottons of the 1926-27, 1927-28, and 1928-29 seasons; in fact, the fibre-weight per inch has now been determined for all the standard cottons from the beginning. In addition to the above-mentioned tests some experiments have been made by Mr. Hari Rao on the clinging-power of cotton hairs, with a view to clearing up some of the anomalies referred to in "Technological Reports, 1928."

With a view to the further elucidation of the fibre-properties some tests have also been made to determine how the properties differ for different fibres on single seeds. So far the only tests made have been of fibre-weight for fibres of different lengths. At the same time, the ginning percentage of the seed is noted, as useful information is thus provided concerning the variation from seed to seed. An account of this work is included in Technological Bulletin, Series B, No. 4.

Chemistry Section.—The chief work carried out by Mr. D. L. Sen in the Chemistry Section has been the quantitative determination of some of the chemical constituents of the standard Indian cottons of 1927-28 and 1928-29, viz., the ash left by each cotton on combustion, and the nitrogen, phosphorus and wax contents of the cottons, including the determination of a number of constants for each wax (melting-point, iodine value and saponification value). Some preliminary experiments have also been carried out, and are being continued, with a view to elucidating the question of the spontaneous combustion of cotton.

Physics Section.—The first two parts of a long investigation by Mr. R. S. Koshal on the fibre-length, fibre-strength, fibre-rigidity, fibre-width, and fibre-convolutions of Surat 1027 A.L.F., 1925-26, have now been completed and two further parts are in course of preparation. Many fibre-strength tests have also been made by Mr. H. N. Dutt on Punjab-American 289F, and Aligarh A. 19. This work has for its object the study of the inter-relation between the various properties, and is expected to throw much light on sampling for fibre-tests, particularly on the question as to the minimum number of observations required for a satisfactory mean value for any one property.

The intensive investigation of the relation between the fibre properties and yarn properties has been continued by Mr. A. N. Gulati during the past year. Various counts of yarn of a number of cottons are spun with different twists and their breaking strengths determined : afterwards a determination is made of the count of the portion of yarn broken, the number of fibres in the cross-section, the fibre-weight per inch of the cotton, and the number of broken fibres in the broken yarn. This investigation is thus an attempt from another angle to determine the parts played by the different fibre-properties in the strength of yarn.

The investigation of the variation of the counts and strength of certain yarns carried out by Mr. D. F. Kapadia is now nearing completion and will probably be published in the form of a Technological Bulletin in the near future.

III. PUBLICATIONS.

The publications of the Technological Laboratory have now been divided into different series, and have consequently been re-numbered. The publications consist of the following :—

Technological Bulletins, Series A.
Technological Bulletins, Series B.
Technological Circulars.

Technological Bulletins, Series A, consist of bulletins which centre round the spinning test and which are accordingly printed in foolscap size ($13\frac{1}{2}'' \times 8\frac{1}{2}''$) to accommodate the tables of spinning test results.

Technological Bulletins, Series B, consist of bulletins which have a wider interest and in which any results of spinning tests are only incidental ; this series of bulletins is printed in the size $9\frac{3}{4}'' \times 6\frac{1}{4}''$.

Technological Circulars consist of small pamphlets issued to deal briefly with some matter of immediate technological interest. Results included in such circulars may later be incorporated in bulletins dealing with the same subject more extensively.

The following lists show the new numbers received by Bulletins and Circulars already issued under the old system of enumeration :—

TECHNOLOGICAL BULLETINS, SERIES A.

Series A No.	Title.	Old No.		Date of Publication.	Price.
		I.C.C.C. Bulletin No.	Technological Series No.		
					Rs. a. p.
1	Explanatory Note on the Conduct of Spinning Tests in the Technological Laboratory, and Standard Cotton Tests Reports	4	1	April 1925 ..	0 4 0
2	Results of Spinning Tests on Standard Indian Cottons	6	2	May 1926 ..	2 0 0
3	Technological Reports on Standard Indian Cottons, 1923-26	7	3	May 1927 ..	2 0 0
4	The Effect of Temperature and Humidity on Cotton Spinning, with particular reference to Conditions in Bombay	9	4	August 1927 ..	2 0 0
5	The Effect of Subjecting Cotton to Repeated Blow-room Treatment ..	10	5	September 1927	1 0 0
6	Technological Reports on Standard Indian Cottons, 1927	11	6	November 1927	2 0 0
7	The Effect of different Spindle Speeds on the Results of Spinning Tests ..	14	9	May 1928 ..	1 0 0
8	The Effect of Using Unbalanced instead of Balanced Drafts in the Spinning Preparation for Spinning Tests	15	10	June 1928 ..	1 0 0
9	Technological Reports on Standard Indian Cottons, 1928	16	11	June 1928 ..	2 0 0
10	Further Tests on the Effect of Temperature and Humidity on Cotton Spinning	19	14	March 1929 ..	1 0 0
11	The Effect of Using either One Head or two Heads of Drawing instead of Three Heads of Drawing in the Spinning Preparation for Spinning Tests	20	15	April 1929 ..	1 0 0
12	Technological Reports on Standard Indian Cottons, 1929	..	..	May 1929 ..	2 0 0
13	Technological Reports on samples of Punjab-American and Mollisoni (*desi*) cottons grown in different parts of the Punjab in the season 1928-29	..	..	May 1929 ..	0 6 0

TECHNOLOGICAL BULLETINS, SERIES B.

Series B No.	Title.	Old No.		Date of Publication.	Price.
		I.C.C.C. Bulletin No.	Technological Series No.		Rs. a. p.
1	The Foundations of Yarn Strength and Yarn Extension— Part I. The General Problem.. Part II. The Relation of Yarn-Strength to Fibre-Strength	12	7	March 1928 ..	1 0 0
2	Research in Cotton Technology in India, 1927	13	8	April 1928 ..	1 0 0
3	A Note on the Early History of Cotton	17	12	October 1928 ..	0 8 0
4	Ginning Percentage and Lint Index of Cotton in Relation to the Number of Cotton Fibres per Seed; the Effect of Environment on Ginning Percentage; and the Determination of Unit Fibre-Weight	18	13	February 1929.	1 0 0

TECHNOLOGICAL CIRCULARS.

Circular No.	Title.	Date of Publication.
1	Comparative Spinning Tests on Machine-ginned and Saw-ginned Punjab-American Type 289F ..	April 1926.
2	Technological Report on Umri Bani, 1927-28 ..	December 1927.
3	Technological Report on Punjab-American 4F, 1927-28	January 1928.
4	Technological Report on Punjab-American 289F, 1927-28	January 1928.
5	Technological Report on Verum 262, 1927-28 (out of print)	January 1928.
6	Technological Report on Surat 1027 A.L.F., 1927-28..	April 1928.
7	Technological Report on Gadag 1, 1927-28	April 1928.
8	Technological Report on Dharwar 1, 1927-28 ..	April 1928.
9	Technological Report on Cambodia Co. 1 (295), 1927-28	April 1928.
10	Technological Report on Hagari 25, 1927-28 ..	May 1928.
11	Technological Report on Rajpipla Cotton, 1927-28 ..	August 1928.
12	Technological Report on Verum 262, 1928-29 ..	November 1928,
13	Technological Report on Punjab-American 4F, 1928-29	December 1928.

Circular No.	Title.	Date of Publication.
14	Technological Report on Punjab-American 289F, 1928-29	December 1928.
15	Technological Report on Umri Bani, 1928-29 ..	December 1928.
16	Technological Report on Surat 1027 A.L.F., 1928-29	March 1929.
17	Technological Report on Cambodia Co. 1 (295), 1928-29	April 1929.
18	Technological Report on Dharwar 1, 1928-29 ..	April 1929.

The following is a list of Publications which have been prepared by the Director, Dr. Turner, and issued during the year :—

(1) Technological Reports on Standard Indian Cottons 1929, Bulletin Series A, No. 12.
(2) Further Tests on the Effect of Temperature and Humidity on Cotton Spinning, Bulletin Series A, No. 10.
(3) The Effect of Using either One Head or Two Heads of Drawing instead of Three Heads of Drawing in the Spinning Preparation for Spinning Tests, Bulletin Series A, No. 11.
(4) Technological Report on Samples of Punjab-American and Mollisoni (*desi*) cottons grown in different parts of the Punjab—in the season 1928-29, Bulletin Series A, No. 13.
(5) A note on the Early History of Cotton, Bulletin Series B, No. 3.
(6) Ginning Percentage and Lint Index of Cotton in Relation to the number of Cotton Fibres per seed ; the Effect of Environment on Ginning Percentage ; and the Determination of Unit Fibre-Weight. Bulletin Series B, No. 4.
(7) The Technological Laboratory of the Indian Central Cotton Committee : a Brochure, descriptive of the History, Work and Aims of the Laboratory.

As in previous years the Director has contributed to the Bombay Cotton Annual a note briefly outlining the work done in the Laboratory during the year 1928-29.

The following are summaries of the Bulletins, Series A, No. 10 and No. 11; and Series B, No. 4 :—

Ginning Percentage and Lint Index of Cotton in Relation to the Number of Cotton Fibres per seed ; the Effect of Environment on Ginning Percentage ; and the Determination of Unit Fibre-Weight.—The amount of lint borne on a single cotton seed is a matter of considerable economic importance.

It is commonly represented by the ginning percentage, i.e., the weight of lint expressed as a percentage of the weight of the seed-cotton from which the lint is obtained ; a more modern method is by reference to the lint index, i.e., the weight of cotton borne by 100 seeds ; the relative merits of these two expressions are briefly discussed. The remainder of the paper is chiefly concerned with an examination of the relation of these two expressions to the number of fibres per seed, and the methods for determining this. It is pointed out that variation in lint-weight and seed-weight may be brought about by many different causes, viz., differences in the age and situation of seeds and bolls, and in the variety and conditions of growth of plants. The work of Leake, Balls, and Burd is then critically reviewed ; the scope of the investigation of each was different, and from the symbolical expressions for their several conclusions it is shown that the claim that their results are mutually confirmatory cannot be sustained ; it is concluded that the lint index cannot be measured only by the number of fibres per seed, and that from the number of variables appearing in the equation for ginning percentage, no direct proportionality ought to be expected between the ginning percentage and the number of fibres per seed, or any other single property, whether volume of seed or unit fibre-weight. These conclusions are confirmed by an examination of the available data, including many new results obtained at the Technological Laboratory for various Indian cottons.

The conclusions of Balls that outturn fluctuations are due to differences in the environmental conditions on the day of flowering, and that the number of epidermal cells which sprout into hairs is determined by such differences, are examined at some length, and shown to be of doubtful tenability ; it appears more probable that lint hairs continue to be differentiated after the day of flowering ; and from Balls's experimental results it appears that the weight of lint per unit area of seed-surface is practically constant for different sizes of seed, and that this almost completely accounts for the fact that smaller seeds have a higher ginning percentage. Whereas Balls's view necessitates that the smaller seeds should each have a greater *total* number of fibres, it is shown that if we take the product of fibre-strength and fibre-length as a measure of unit fibre-weight, higher ginning percentage is more generally associated with a *smaller* number of fibres per seed. However, neither the total number of fibres per seed nor the number of fibres per unit area of seed-surface is directly proportional to the seed-weight or to the ginning percentage, so that these results do not enable us to decide whether or not the differentiation of all the lint cells takes place on the day of flowering, or what may be the influence of the environment on this differentiation.

It is pointed out that it is advantageous to study the ginning percentage of individual seeds, and a number of such results are given for the Bengals cotton, Aligarh A. 19, and for Punjab-American 4F. These cottons also display the property of association of high ginning percentage with low seed-weight ; the weight of lint per unit seed-surface is practically the same on the average for the small, medium, and large 4F seeds, but fluctuates considerably for individual bolls of A. 19. From actual determinations of

fibre-weight in each case, it is again concluded that neither the total number of fibres per seed nor the number per unit area of seed-surface is directly proportional either to the seed-weight or to the ginning percentage.

In order to determine the number of fibres per seed it is necessary to ascertain the weight of the single fibre, and the various methods of doing this are discussed. It has been claimed that for a given variety of cotton the fibre-weight per unit length is independent of the fibre-length. From an examination of the various possibilities in the development of lint on the seed, it is concluded that, if we take into consideration both the hereditary and environmental factors operating during the growth of the lint, the fibre-weight per unit length may differ for different lengths of fibre, and that, in general, a tendency may exist for the shorter fibres to have a rather greater fibre-weight per unit length. Results are given for certain Indian cottons which show not only that some varieties do display a greater fibre-weight per unit length for their short fibres, but also that in some cases the fibre-weight of individual fibres decreases very considerably from the middle of the fibre to the apex. These results hold good even for the fibres on an individual seed. The paper concludes with a description of a method for determining the average number of fibres of each group-length per seed, and summarises the results so far published for the number of fibres per seed of different varieties of cotton.

Further Tests on the Effect of Temperature and Humidity on Cotton Spinning.—In Bulletin No. 4, a description was given of spinning tests carried out under three sets of conditions: (1) medium-dry, i.e., temperature about 79° F., and relative humidity 46 per cent., but in one case as low as 31 per cent.; (2) normal, i.e., temperature about 82° F., and relative humidity 65 per cent.; (3) monsoon, i.e., temperature 90° F., and relative humidity 70 per cent.

From these tests it was concluded that the processing of the material in cotton spinning and the quality of the spun yarn are not seriously affected by the spinning processes being carried out at a relative humidity as low as 40 per cent.; although for the comfort of the working staff the normal conditions are more satisfactory than extreme conditions of dryness or dampness. Further tests have now been carried out with the object of testing the effect of conditions similar to those often experienced in up-country mills, viz., a temperature of about 100° F. and a relative humidity of about 25 per cent. These conditions are described as " hot-dry."

The tests were restricted to the two cottons, Nandyal 14 (Northerns), and Memphis (American), which were spun under all four sets of conditions. Observations were made, under each set of conditions, of (1) comfort in working; (2) workability of material; and (3) the appearance of the yarn. In addition, determinations were made of (4) the regain of the cotton at various stages; (5) the yarn-strength; and (6) the yarn-extension.

The results obtained confirm and extend those of the previous tests. By reducing the relative humidity to below 30 per cent. a stage is reached when drawing cannot be carried out satisfactorily; moreover, yarn breakages on the ring frame become more numerous at this low humidity, the effect being especially pronounced in the higher counts, which also have lower strength when spun under very dry conditions. It is accordingly concluded that although for Indian cottons spun into counts not higher than 40s it is sufficient to keep the relative humidity rather above 30 per cent., yet if higher counts were to be spun, bad spinning troubles would be still more in evidence, and it would be desirable to work at a higher relative humidity, say at least 40 per cent., or even higher for very fine counts. The yarns spun under the various conditions of temperature and humidity while very similar in evenness and neppiness, yet differ widely in their appearance, for the yarns spun under the hot-dry conditions are very oozy indeed, full of snarls, and suffer from the same defects to a lesser extent, whereas the yarns spun under normal and monsoon conditions are free from them. However, all these differences between the yarns almost entirely disappear when the yarns are conditioned by immersion in water.

The Effect of Using either One Head or Two Heads of Drawing instead of Three Heads of Drawing in the Spinning Preparation for Spinning Test.—In spinning tests at the Technological Laboratory the card sliver is passed through two heads of drawing only, even for 40s counts, whereas three heads of drawing are commonly employed in Indian mills. In order to determine experimentally how far this procedure is justified, comparative tests have been made on eight standard Indian cottons and two American cottons; a 30-lb. sample of each of these lots was passed through one head of drawing, two were passed through the normal two heads of drawing, and the remaining two lots were passed through three heads of drawing. A record was maintained of the number of yarn breakages in the ring frame, and each yarn was classified for evenness and neppiness, and subjected to tests for counts, lea strength, single thread strength and extension, and twist. In all, 9,000 tests were made for lea strength and counts, 18,000 tests for single thread strength and extension, and 18,000 tests for twist.

From the various test results it is clear that whether the card sliver is subjected to one, two, or three heads of drawing makes little difference to the number of yarn-breakages sustained in the ring frame, or to the various yarn-properties, viz., evenness, neppiness, strength, and extension. It is true that the yarns for the two and three heads of drawing are slightly stronger than those for one head of drawing, but the difference is small, and as between the yarns for the two and three heads of drawing there is very little to choose. It follows, therefore, that the practice at the Technological Laboratory so using only two heads of drawing gives results similar to what might be expected from three heads of drawing. It is emphasized, however, that the card sliver used for drawing in these tests is the production of a single card; and that, if, as in mill practice, card slivers from a number of cards were to be fed to the first head of drawing, the results would be affected

by the extent of the differences between the different card slivers, so that this effect would have to be allowed for in applying the results of the present tests to mill practice.

IV. GENERAL.

(1) *Staff.*—The staff of the Laboratory on 31st August 1929 was as follows :—

Director :—A. James Turner, M.A., D.Sc. (on leave).

Officiating Director and Spinning Master :—R. P. Richardson, A.T.I.

Research Laboratory.

Physics Section :—

Senior Research Assistant :—Hari Rao Navkal, M.Sc.
Junior Research Assistant :—Ram Saran Koshal, M.Sc.
Junior Testing Assistants :—S. S. Sukthankar, L.T.C. ; K. G. Deo ; H. B. B. Joshi, B.Sc. ; K. S. Marar, B.A., LL.B. ; R. G. Panvalkar, B.Sc.

Chemistry Section :—

Senior Research Assistant:—D. L. Sen, M.Sc.Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistants :—H. N. Dutt, B.Sc., M.B. ; Amar Nath Gulati, M.Sc.

Instrument Maker :—Moreshwar M. Patke.

Spinning Laboratory.

Assistant Technologist :—D. F. Kapadia, B.Sc.Tech., B.A.

Yarn Testing Section :—
Statistician :—V. Venkataraman, M.A.
Junior Testing Assistants :—G. D. Bhide, B.Sc. ; K. V. N. Nayar ; V. N. Modak, B.Sc. ; L. V. Sundararaman, B.A. ; P. S. Sambamurthi ; G. J. Kharkar, B.Sc.
Statistical Clerks :—R. Krishna Iyer ; P. K. Wagle.
Spinning Assistant :—N. Iyengar.
Electrician :—Herculano Lobo, L.E.E.
Clerk :—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk :—M. T. Majmudar.
Stenographer :—B. P. Jain.
Clerk :—M. T. Sundaram.
Draughtsman :—B. G. Mehta.

The Director, Dr. Turner, proceeded to England on the 15th June 1929 on leave for 5 months and 19 days.

The Spinning Master, Mr. Richardson, has officiated as Director during Dr. Turner's absence, in addition to his own duties.

(2) *Research Students.*—Mr. R. L. N. Iyengar, on the completion of his two years' research studentship, proceeded to the post of Technological Assistant to the Cotton Specialist, Coimbatore, in place of Mr. K. R. Sen who was transferred by the Committee to Lyallpur.

Mr. C. Nanjundayya, Research Scholar, has continued to make good progress in his investigation of " the variation of fibre-weight along the length of the fibre." He has just completed the eighteen standard cottons of the season 1927-28 and is now engaged on the standard cottons of the season 1928-29.

Mr. Srinagabhushana was awarded a Research Studentship by the Committee and took up his duties on the 18th January 1929 and after suitable training in the various methods employed in fibre testing was set to determine the changes (if any) in fibre properties of a number of standard cottons at different stages in the preparation processes for spinning.

Mr. H. R. Nayak, who worked in the Laboratory as a Junior Testing Assistant for the past 4½ years, was appointed by the Committee to the post of Technological Assistant, Dharwar, recently vacated by Mr. S. E. Kumana who was formerly a Research Student in the Laboratory and has recently been awarded a scholarship tenable at the London University.

(3) *Buildings and equipment.*—There has been no additions made during the year either to the Laboratory building or to the major equipment of the Laboratory. An extensive fall of plaster from one of the ceilings of the first floor in the Research Laboratory building occurred and as a consequence the ceilings throughout the whole building have been replastered and the inner walls of the rooms concerned colour-washed : this work is now nearing completion. The Goodbrand power lea tester mentioned in the last Annual Report has now been fitted with a ⅛ h.p. single-phase induction motor and subsequently erected on the north wall of the Spinning Laboratory and has since given very satisfactory service. A Bone and Wheeler's gas analysis apparatus has been recently received for use in connection with an investigation on the Spontaneous Combustion of cotton. As in the past the Instrument Maker has been fully engaged during the year in

either general repair work or making new apparatus. One such piece of apparatus is in connection with a test to be carried out by Mr. D. F. Kapadia on the single thread strength of different lengths of yarn to be compared with the lea strength.

(4) *Visitors.*—Many individuals and several parties have visited the Laboratory and have seen the work in progress, during the year under review, among whom may be mentioned the recent visit of representatives, jointly, of the East India Cotton Association and the Bombay Millowners' Association. It is expected that as a result of this visit the Laboratory will in the immediate future undertake tests of more direct interest and immediate value to the manufacturing side of the Cotton Industry in India in addition to the many research problems at present under investigation.

Much of the material incorporated in this Annual Report was actually prepared by the Director, Dr. Turner, before his departure to England on leave and to whom therefore my thanks are accordingly due.

Opportunity is here taken to thank, once again, the several members of the East India Cotton Association for their prompt and valuable support in grading the many samples of cotton submitted to the Laboratory for spinning test. The Grader's report forms a very valuable feature in the various Spinning Test and Technological Reports.

In conclusion, it affords me genuine pleasure in having this opportunity of placing on record my sincere thanks to the various members of the Laboratory staff, for their uniform loyalty and excellent work. The Sample Distribution List in the earlier part of this report shows the present year under review to have been a very busy one and much of the work is, in the nature of the case, very laborious and calls for the greatest possible care and patience.

R. P. RICHARDSON,
Acting Director, Technological Laboratory.

24th October 1929.

TABLE I.—FIBRE PROPERTIES OF STANDARD INDIAN COTTONS, 1926-29.

A.—ENGLISH UNITS.

Report No.	Cotton.	Season.	Fibre-Length (inch.)	Fibre-Weight per inch. (10^{-6} oz.)	Fibre-Strength (oz.)	Fibre-Strength (oz.) ÷ Fibre-Weight per inch. (10^{-6} oz.)	Ribbon Width. 10^{-3} inch.	Convolutions per inch.	Fibre Rigidity (oz.-in.^{2} $\times 10^{-6}$)	Fibre-Rigidity ÷ (Fibre Weight)^2	Highest Standard Warp Counts.
1	Dharwar 1	1926-27	0.89	0.204	0.168	0.82	0.61	67	0.109	0.26	34
	,,	1927-28	0.89	0.202	0.152	0.75	0.65	76	0.132	0.32	32
	,,	1928-29	0.87	0.182	0.129	0.71	0.61	81	0.127	0.39	34
2	Gadag I	1926-27	0.81	0.179	0.141	0.79	0.63	110	0.151	0.47	38
	,,	1927-28	0.86	0.167	0.148	0.89	0.62	115	0.152	0.55	38
	,,	1928-29	0.82	0.162	0.141	0.87	0.59	122	0.138	0.53	26
3	Surat 1027 A. L. F.	1926-27	0.97	0.200	0.171	0.85	0.73	96	0.162	0.40	32
	,,	1927-28	0.94	0.207	0.167	0.81	0.74	73	0.132	0.31	30
	,,	1928-29	0.96	0.204	0.165	0.81	0.71	63	0.125	0.30	32
4	Wagad 4	1926-27	0.85	0.257	0.179	0.70	0.68	46	0.189	0.29	16
	,,	1927-28	0.79	0.181	0.109	0.60	0.70	47	0.101	0.31	18
	,,	1928-29	0.84	0.216	0.138	0.64	0.77	56	0.174	0.37	16
5	Wagad 8	1926-27	0.80	0.264	0.178	0.67	0.72	45	0.221	0.32	14
	,,	1927-28	0.77	0.189	0.124	0.66	0.72	46	0.122	0.34	14/16
	,,	1928-29	0.80	0.239	0.144	0.60	0.76	58	0.135	0.24	14/16
6	P. A. 4 F	1926-27	0.78	0.134	0.132	0.99	0.70	104	0.093	0.52	24
	,,	1927-28	0.79	0.186	0.156	0.84	0.70	102	0.210	0.61	22
	,,	1928-29	0.76	0.197	0.169	0.86	0.68	99	0.234	0.60	16
7	P. A. 285 F	1926-27	0.82	0.104	0.115	1.10	0.64	100	0.059	0.55	34
	,,	1927-28	0.89	0.133	0.131	0.99	0.59	110	0.104	0.59	34
	,,	1928-29	0.88	0.125	0.108	0.86	0.67	90	0.099	0.63	34
8	P. A. 289 F	1926-27	0.97	0.098	0.109	1.11	0.62	88	0.053	0.55	38
	,,	1927-28	0.94	0.142	0.135	0.95	0.62	118	0.092	0.46	40
	,,	1928-29	0.96	0.122	0.151	1.24	0.58	122	0.093	0.62	38
9	Mollisoni	1926-27	0.68	0.272	0.164	0.60	0.77	65	0.242	0.33	8
	,,	1927-28	0.73	0.335	0.195	0.58	0.88	114	0.463	0.41	8
	,,	1928-29	0.69	0.303	0.182	0.60	0.76	106	0.512	0.56	6/8
10	Aligarh A. 19	1926-27	0.66	0.301	0.187	0.62	0.79	80	0.361	0.40	6/8
	,,	1927-28	0.70	0.305	0.199	0.66	0.82	72	0.450	0.48	6/8
	,,	1928-29	0.71	0.324	0.225	0.69	0.74	67	0.641	0.61	6/8
11	Cawnpore K. 22	1926-27	0.73	0.240	0.178	0.74	0.71	72	0.280	0.49	12
	,,	1927-28	0.75	0.244	0.174	0.72	0.78	70	0.376	0.63	12
	,,	1928-29	0.78	0.225	0.166	0.74	0.68	71	0.257	0.51	14
12	Bundelkhand J. N. 1.	1926-27	0.77	0.242	0.183	0.76	0.71	65	0.216	0.37	14
	,,	1927-28	0.74	0.226	0.199	0.88	0.71	74	0.245	0.48	14
	,,	1928-29	0.76	0.236	0.208	0.86	0.72	85	0.280	0.50	12/14
13	CawnporeAmericanC.A.9	1926-27	0.87	0.182	0.160	0.88	0.61	119	0.185	0.56	34
	,,	1927-28	0.86	0.176	0.151	0.86	0.63	105	0.170	0.55	30
	,,	1928-29	0.89	0.166	0.158	0.95	0.60	127	0.239	0.87	40
14	Verum 262 (Nagpur)	1928-29	0.85	0.215	0.199	0.93	0.62	72	0.193	0.42	26
	Verum 262 (Akola)	1928-29	0.83	0.187	0.174	0.93	0.63	79	0.136	0.39	22/24
15	Umri Bani	1926-27	0.81	0.200	0.186	0.93	0.67	65	0.160	0.40	24
	,,	1927-28	0.81	0.192	0.179	0.94	0.63	93	0.188	0.51	24
	,,	1928-29	0.83	0.185	0.176	0.96	0.63	88	0.196	0.57	22
16	Cambodia Co. 1 (295)	1926-27	0.92	0.155	0.127	0.82	0.59	91	0.124	0.52	38
	,,	1927-28	0.93	0.164	0.138	0.84	0.60	110	0.134	0.50	34
	,,	1928-29	0.93	0.170	0.125	0.74	0.62	126	0.179	0.62	32
17	Cambodia Co. 2 (440)	1927-28	0.88	0.141	0.123	0.87	0.62	108	0.138	0.69	32/34
	,,	1928-29	0.92	0.148	0.099	0.67	0.61	90	0.099	0.45	26
18	Nandyal 14	1926-27	0.93	0.191	0.223	1.17	0.61	46	0.142	0.39	34
	,,	1927-28	0.88	0.196	0.229	1.17	0.67	56	0.147	0.38	30/32
	,,	1928-29	0.91	0.187	0.236	1.26	0.65	60	0.169	0.48	30/32
19	Hagari 1	1928-29	0.84	0.207	0.140	0.68	0.65	78	0.164	0.38	24
20	Hagari 25	1926-27	0.76	0.177	0.110	0.62	0.65	54	0.097	0.31	26
	,,	1927-28	0.87	0.205	0.135	0.66	0.70	76	0.112	0.27	26
	,,	1928-29	0.90	0.188	0.132	0.70	0.65	75	0.098	0.28	30
21	Karunganni C 7	1926-27	0.85	0.192	0.183	0.95	0.65	57	0.170	0.46	24
	,,	1927-28	0.85	0.183	0.177	0.97	0.62	62	0.156	0.47	24
	,,	1928-29	0.81	0.186	0.159	0.85	0.70	74	0.184	0.52	20
22	Mississippi	1923-24	0.99	0.183	0.180	0.98	0.65	142	0.138	0.41	30
	Memphis	1925-26	0.95	0.181	0.154	0.86	0.62	110	0.146	0.45	40
23	Texas	1925-26	0.86	0.206	0.164	0.80	0.58	140	0.210	0.49	30

TABLE 2.—SUMMARY OF SPINNING TEST RESULTS ON STANDARD INDIAN COTTONS, 1923-29.

(a) BOMBAY AND PUNJAB COTTONS.

Sample No.	Cotton.	Season.	Counts Nominal.	Waste Percentages. Blow Room Loss.	Card Room Loss.	Spinning Loss.	Total Loss.	Ring Frame Particulars* Yarn Breakages per 100 spindles per hour.	Speed R. P. M.	Draft.	Turns per Inch.	Yarn Test Results. Lea. Counts Actual.	Strength (lbs.)	Strength Irregularity (%).	Count-Strength Product.	Single Thread. Counts.	Strength (ozs.)	Strength Irregularity (%).	Weakness Percentage.	Extension (%).	Extension Irregularity (%).	Evenness Class.	Nops per Yard.	Turns per Inch Actual.	Temperature (°F.) Spinning Room.	Relative Humidity (%). Spinning Room.	Testing Room.	Highest Standard Warp Counts.
62	Dharwar I	1923-24	22	3.4	7.8	0.7	11.9	6	183	4.45	16.85	19.7	87.5	4.7	1,931	..	10.7	9.6	2.4	4.2	16.5	2	1.12	..	86	79	68	34
72	,,	1923-24	22	12.7	8.5	0.9	22.1	32	183	4.45	16.85	19.6	90.6	4.9	1,914	..	13.6	7.1	4.4	5.0	16.5	2	1.12	..	86	79	68	34
125	,,	1925-26	22	12.3	7.1	0.4	18.8	3	182	4.56	16.85	19.9	90.6	4.9	1,776	..	11.3	8.5	0.5	6.1	16.7	2	1.12	..	92	63	63	34
234	,,	1926-27	20	12.6	7.4	0.3	20.3	2	182	4.56	16.85	19.9	89.6	5.0	1,772	19.1	12.3	7.1	1.7	7.1	16.2	2	1.12	16.2	90	65	65	34
373	,,	1927-28	20	13.5	8.0	0.1	23.0	2	181	4.52	16.85	20.0	88.7	5.6	1,774	20.2	12.3	12.1	4.5	6.6	8.5	2	2.7	16.2	88	66	69	32
497	,,	1928-29	20	14.0	8.8	0.3	21.6	2	182	4.39	16.85	20.1	91.3	3.3	1,833	20.2	12.1	6.8	1.3	7.4	16.3	2	1.14	16.3	88	64	69	34
70	Gadag I	1923-24	20	4.5	7.1	0.8	12.1	12	183	4.58	16.85	19.7	90.0	6.7	1,804	..	10.2	9.6	2.8	3.6	14.4	2	1.1	..	84	77	65	36
71	,,	1924-25	20	4.4	6.8	0.3	11.5	3	183	4.58	16.85	19.6	89.2	6.5	1,768	..	10.4	7.4	0.2	4.8	9.6	2	1.1	..	84	76	64	36
131	,,	1925-26	20	3.6	8.5	0.5	12.6	10	180	4.70	16.85	19.6	93.7	6.3	1,842	..	10.6	12.4	4.2	6.9	11.6	2	1.1	..	91	67	63	36
244	,,	1926-27	20	3.5	7.3	0.2	11.0	3	182	4.44	16.85	19.7	90.4	4.0	1,926	19.7	11.4	3.5	2.8	5.8	11.8	2	1.12	16.2	88	66	61	36
368	,,	1927-28	20	5.5	7.8	0.1	13.1	4	180	4.52	16.85	19.7	94.1	5.2	2,054	20.1	13.9	9.5	1.7	7.3	9.1	2	2.9	16.2	87	66	61	38
518	,,	1928-29	20	8.7	8.6	0.8	17.1	44	181	4.30	16.85	20.2	77.0	5.8	1,434	20.4	10.2	12.0	3.7	6.3	7.6	3	2.1	16.2	87	63	69	26
104	Surat 1027 A.L.F.	1923-24	20	6.3	9.0	0.6	14.3	10	182	4.12	16.85	19.6	75.1	6.1	1,487	..	10.6	8.9	0	5.7	9.2	..	..	..	86	69	49	30
68	,,	1924-25	20	6.2	7.6	0.4	12.0	4	181	4.09	16.85	19.2	96.0	4.1	1,853	..	10.9	11.6	5.0	11.6	3.4	2	1.2	..	86	70	64	32
115	,,	1925-26	20	5.3	7.2	0.6	12.5	15	182	4.12	16.85	19.9	73.8	8.9	1,449	..	10.9	11.0	4.2	5.6	9.5	2	1.2	..	85	63	62	28
246	,,	1926-27	20	6.1	7.2	0.4	13.3	10	182	4.39	16.84	19.6	88.1	4.2	1,727	..	12.5	8.4	0.2	6.7	6.2	2	2.0	16.2	88	64	62	32
363	,,	1927-28	20	6.2	7.2	0.2	13.6	3	180	4.39	16.84	20.0	78.0	5.8	1,560	20.3	12.5	9.9	2.7	5.9	7.8	2	2.1	16.4	84	64	64	30
483	,,	1928-29	20	4.8	7.5	0.2	11.6	17	180	4.44	16.85	19.5	95.8	4.2	1,868	19.9	12.6	9.2	0.7	7.0	7.0	2	3.3	16.3	88	68	67	32
161	Wagad 4	1925-26	14	8.0	12.6	0.5	20.8	3	188	7.32	15.97	13.6	90.1	5.0	1,221	..	13.1	10.6	2.8	8.1	9.5	2	1.7	..	85	78	72	16
272	,,	1926-27	14	7.8	8.5	0.5	16.9	17	188	7.26	15.98	14.4	84.5	5.6	1,361	..	13.5	11.0	0.7	8.0	6.6	2	1.6	14.2	87	74	71	16
377	,,	1927-28	14	7.9	9.1	0.3	17.3	3	187	7.26	15.98	14.3	84.2	5.1	1,344	14.8	13.8	9.5	2.4	5.9	3.9	2	1.6	14.2	87	69	68	16
498	,,	1928-29	14	7.8	8.2	0.2	15.7	6	191	5.74	15.08	14.3	94.9	4.8	1,357	14.6	12.8	9.9	2.2	9.0	7.7	2	2.1	14.8	87	71	72	16
160	Wagad 8	1925-26	14	8.3	12.6	0.4	20.5	3	174	6.85	15.97	13.7	84.7	7.5	1,160	..	12.8	9.8	1.5	6.2	9.8	3	1.4	14.2	87	81	82	12
271	,,	1926-27	14	7.4	8.4	0.4	15.8	4	174	6.89	15.08	14.0	90.0	6.0	1,236	14.2	11.8	12.3	5.7	7.9	7.0	4	1.2	14.2	87	79	72	14
372	,,	1927-28	14	7.8	8.6	0.2	16.6	0	174	6.89	15.08	14.0	88.6	4.4	1,240	14.5	11.8	9.6	1.5	8.2	7.2	3	1.2	14.1	87	70	70	14/16
494	,,	1928-29	14	7.8	8.2	0.2	16.2	10	174	5.74	15.08	14.3	92.4	4.8	1,321	14.8	12.5	9.6	1.5	8.2	7.2	3	1.2	14.1	88	63	71	14/16
81	P. A. 4F	1924-25	20	7.9	7.8	1.0	15.7	22	181	5.27	16.85	19.5	63.1	6.8	1,258	..	8.7	33.6	7.0	4.7	17.5	3	1.4	..	73	78	61	22
127	,,	1925-26	20	9.7	9.5	0.4	19.1	2	180	6.00	16.85	19.7	73.7	7.3	1,370	..	13.2	11.0	3.3	8.2	10.6	3	2.1	61	63	58	22
232	,,	1926-27	20	9.5	9.5	0.3	19.3	1	181	5.32	16.85	19.6	75.2	4.6	1,482	20.2	10.1	7.7	2.3	6.6	8.2	3	3.1	16.2	86	64	63	24
340	,,	1927-28	20	6.4	7.8	0.3	14.6	32	187	5.21	16.85	19.4	68.5	5.3	1,290	19.9	9.2	13.6	6.5	7.4	9.9	3	1.9	16.8	81	69	63	22
446	,,	1928-29	20	8.6	10.4	0.6	19.6	57	178	5.21	16.85	19.5	73.5	7.5	1,366	20.0	8.0	16.6	9.5	7.2	8.2	3	4.3	16.4	88	67	70	14
106	P. A. 285F	1923-24	20	10.8	10.2	0.6	20.1	6	182	4.12	16.85	19.2	100.0	4.7	2,010	..	12.8	9.9	2.6	6.6	9.1	..	..	..	84	69	52	34
85A	,,	1924-25	20	4.7	9.8	0.6	14.6	15	181	4.58	16.85	19.0	97.0	6.6	1,843	..	11.5	9.3	1.3	4.8	16.1	3	1.5	..	85	64	63	34
115	,,	1925-26	20	10.8	11.1	0.4	21.1	16	182	4.12	16.83	19.3	82.9	4.8	1,690	..	11.8	10.9	1.7	6.1	10.2	3	5.0	..	86	64	63	32
233	,,	1926-27	20	12.2	12.9	0.4	25.5	3	181	4.58	16.85	19.4	72.0	3.8	1,479	19.4	11.2	7.9	1.8	7.9	6.8	3	3.1	16.2	90	64	63	34
367	,,	1927-28	20	8.4	12.4	0.5	20.0	5	181	4.55	16.85	19.8	85.9	4.1	1,689	20.1	12.4	10.3	2.0	6.8	7.1	3	13.2	16.8	89	64	68	34
476	,,	1928-29	20	9.2	11.7	0.1	19.2	7	184	4.35	16.85	19.3	90.1	4.8	1,835	19.8	13.3	10.0	2.3	7.8	8.8	3	20.7	16.8	88	68	72	34
80	P. A. 289F	1924-25	22	8.7	9.6	0.4	17.2	22	181	4.81	16.84	20.4	88.5	5.5	1,805	..	11.8	10.7	3.0	10.7	13.4	3	0.6	..	80	73	61	32
126	,,	1925-26	22	12.5	12.1	0.3	24.9	4	182	4.58	16.85	19.3	84.0	4.7	1,700	..	12.9	9.8	1.3	7.6	8.8	3	1.7	..	85	68	63	32
234	,,	1926-27	22	12.7	12.1	0.3	25.1	5	182	4.58	16.85	19.3	107.5	7.4	2,075	19.9	14.9	9.5	1.3	7.6	8.8	2	28.7	16.4	90	68	70	38
341	,,	1927-28	22	8.5	10.6	0.2	19.3	9	181	4.51	16.85	19.3	104.2	5.8	2,012	19.8	14.2	10.1	1.6	8.5	9.5	2	4.0	16.3	85	68	68	38
449	,,	1928-29	22	10.8	13.4	0.2	25.0	7	188	4.49	16.85	20.4	89.5	5.0	1,840	20.0	12.8	11.5	3.7	6.9	8.2	3	16.4	16.2	84	68	68	38
122	Mollisoni	1925-26	5.1	7.7	1.2	13.4	0	174	5.08	12.07	8.0	76.5	10.3	613	..	13.0	15.3	18.2	11.8	12.7	6.0	0.7	..	..	84	61	62	8
230	,,	1926-27	5.2	7.1	0.3	15.0	18	186	4.63	12.07	7.7	111.3	6.6	858	7.6	15.3	18.3	11.8	12.6	9.4	5.5	1.0	11.8	89	64	81	8
324	,,	1927-28	5.2	6.9	0.3	12.4	0	186	4.53	12.07	7.9	101.2	6.3	800	7.8	15.5	18.5	11.9	8.6	8.6	4	1.2	11.8	83	66	68	8
450	,,	1928-29	5.1	9.0	0.3	14.6	5	182	5.41	12.07	7.7	79.0	9.0	608	7.9	14.2	16.2	10.6	10.9	9.1	5	1.6	12.0	84	67	68	6/8

* The ring frame front roller diameter used in these tests has a diameter of ¾ inch.

(b) UNITED PROVINCES, CENTRAL PROVINCES, AND HYDERABAD COTTONS.

Sample No.	Cotton.	Season.	Counts Nominal.	Waste Percentages. Blow Room Loss.	Card Room Loss.	Spinning Loss.	Total Loss.	Ring Frame Particulars* Yarn Breakages per 100 spindles per hour.	Speed Front Roller R. P. M.	Draft.	Turns per Inch.	Yarn Test Results. Lea. Counts Actual.	Strength (lbs.)	Strength Irregularity (%).	Count-Strength Product.	Single Thread. Counts.	Strength (ozs.)	Strength Irregularity (%).	Weakness Percentage.	Extension (%).	Extension Irregularity (%).	Evenness Class.	Nops per Yard.	Turns per Inch Actual.	Temperature (°F.) Spinning Room.	Relative Humidity (%). Spinning Room.	Testing Room.	Highest Standard Warp Counts.
22	Aligarh A. 19	1924-25	4	4.6	7.6	1.1	12.8	20	250	4.80	12.07	7.7	83.0	15.6	591	..	17.7	16.1	9.5	5.2	19.5	..	..	..	90	85	79	6/8
111	,,	1925-26	4	5.6	9.0	1.0	15.7	53	250	5.00	12.07	7.7	79.7	7.9	609	..	17.6	15.8	4.3	5.0	9.4	..	0.5	..	84	64	64	6/8
222	,,	1926-27	4	5.2	8.6	0.5	12.9	32	252	5.00	12.07	7.8	73.1	7.5	586	..	15.6	13.6	4.2	6.9	9.4	..	0.5	..	84	64	64	6/8
352	,,	1927-28	4	3.1	7.6	0.5	11.2	11	252	5.20	12.07	7.6	87.9	8.3	664	8.1	15.0	16.6	11.5	7.4	9.9	..	0.5	11.6	81	68	70	6/8
481	,,	1928-29	4	3.8	7.9	0.7	12.4	15	252	5.20	12.07	7.7	79.0	9.3	608	8.0	15.2	16.8	11.8	7.4	9.9	..	0.5	11.6	84	66	71	6/8
79	Cawnpore K. 22	1924-25	10	8.4	7.7	0.4	16.6	85	211	5.27	12.63	9.5	117.3	8.6	1,113	..	19.7	13.3	5.0	7.8	10.7	3	1.7	..	78	75	54	12
126	,,	1925-26	10	6.3	10.4	0.8	16.7	25	195	4.95	12.63	9.7	125.6	5.3	1,218	..	19.0	12.1	2.3	5.7	15.8	3	4.5	..	92	72	63	12
228	,,	1926-27	10	4.0	6.9	0.4	10.8	5	198	5.36	12.63	9.7	107.1	4.3	1,039	..	16.5	14.8	7.2	8.7	7.9	3	1.0	..	85	68	65	12
351	,,	1927-28	10	4.1	7.2	0.2	11.5	3	198	5.36	12.63	9.8	114.2	4.8	1,119	10.4	18.0	10.0	2.3	7.8	8.8	3	1.6	12.4	87	68	68	12
481	,,	1928-29	10	5.9	7.0	0.2	13.1	6	192	4.35	12.63	10.6	118.8	4.4	1,247	10.4	18.0	10.0	2.7	7.8	6.0	3	1.6	12.4	87	68	71	14
78	Bandalkhand J. N.	1924-25	10	5.7	7.1	0.8	12.1	78	192	5.80	13.58	10.4	115.7	9.5	1,203	..	18.9	19.7	9.0	10.7	13.4	3	0.6	..	80	73	61	12
126	,,	1925-26	10	6.3	10.4	0.6	17.3	22	195	4.95	12.63	10.4	127.6	5.7	1,327	..	19.0	12.1	2.3	5.7	14.6	3	1.7	..	92	72	63	12
228	,,	1926-27	10	7.1	7.5	0.3	14.9	2	198	4.88	12.63	9.9	118.5	6.7	1,175	9.6	17.6	14.0	5.9	9.3	8.8	3	0.6	12.4	85	68	68	14
350	,,	1927-28	10	5.9	7.7	0.3	13.9	5	198	4.88	12.63	10.0	109.5	5.8	1,100	10.5	17.9	11.4	6.2	8.9	8.2	3	0.6	12.2	90	68	68	14
450	,,	1928-29	10	6.1	7.9	0.2	14.2	10	197	4.84	12.63	10.1	107.1	6.1	1,114	10.5	18.1	11.4	6.2	8.9	8.2	3	0.6	12.2	89	68	68	12/14
77	Cawapore C. A. 9	1924-25	26	6.9	7.6	0.7	14.5	16	194	4.49	16.88	19.1	84.4	7.2	1,618	..	12.0	9.2	1.7	4.8	15.9	4	2.0	..	82	76	56	28
112	,,	1925-26	26	8.6	9.4	0.5	15.8	17	194	4.00	16.83	19.0	83.5	8.0	1,587	..	11.6	10.3	2.3	5.7	10.4	3	3.1	..	86	63	63	28
217	,,	1926-27	26	6.7	8.6	0.4	15.7	3	194	4.23	16.83	19.2	74.5	7.9	1,431	..	12.0	14.6	7.5	7.7	7.9	3	3.2	16.3	86	64	63	28
349	,,	1927-28	26	6.7	8.8	0.3	15.8	2	195	4.65	16.88	19.9	76.6	5.7	1,524	20.8	10.4	10.5	3.7	5.8	10.3	3	3.2	16.2	86	64	68	30
497	,,	1928-29	26	8.9	10.0	0.3	16.2	2	195	4.65	16.88	20.1	97.2	5.8	1,954	20.7	12.9	10.5	1.0	6.7	6.4	3	4.6	16.1	83	68	75	40
247	Verum 262	1926-27	20	6.6	10.7	0.4	16.8	20	180	6.76	16.83	20.4	69.0	9.5	1,224	..	10.6	12.0	1.0	7.2	7.0	4	2.1	..	88	68	62	24
346	(Nagpur)	1927-28	20	3.6	8.6	0.5	12.7	3	180	6.76	16.83	20.4	70.0	9.5	1,242	20.4	10.0	13.3	6.6	6.3	8.2	3	2.1	16.2	91	68	68	24
465	Verum (Akola)	1928-29	20	6.5	9.8	0.4	17.4	10	180	6.76	16.83	19.4	77.0	9.5	1,367	19.9	9.0	14.8	6.6	6.3	8.7	4	3.8	16.2	84	68	68	24
220		1926-27	20	6.5	9.8	0.4	16.7	10	180	5.32	16.83	19.8	72.2	7.8	1,104	19.7	12.3	8.3	2.3	6.9	9.3	3	1.3	16.0	81	64	61	18/20
483		1928-29	20	5.1	7.8	0.2	13.1	10	180	4.70	16.83	20.0	90.7	8.5	1,814	20.4	10.0	13.3	6.6	6.3	8.2	3	2.1	16.2	88	68	68	22/24
82	Umri Bani	1924-25	26	15.6	10.7	0.7	25.3	80	182	5.20	16.83	19.7	60.7	9.0	1,196	..	9.3	13.4	8.5	5.1	10.9	..	4.1	..	82	72	64	26
114	,,	1925-26	26	12.5	8.6	0.5	20.6	11	181	5.19	16.83	19.8	70.6	10.0	1,383	..	9.6	13.0	8.5	5.9	16.2	..	4.1	..	86	68	63	24
233	,,	1926-27	26	11.5	7.6	0.3	19.4	3	181	5.19	16.83	19.8	72.2	7.8	1,401	20.1	11.0	8.3	2.3	6.9	9.3	3	3.1	16.2	86	68	63	24
367	,,	1927-28	26	11.6	9.0	0.4	19.8	1	181	5.19	16.83	20.1	68.9	6.4	1,385	21.7	9.1	15.2	9.7	6.7	8.4	4	3.1	16.2	88	68	67	24
451	,,	1928-29	26	11.7	8.9	0.2	19.8	35	180	5.38	16.83	20.0	61.9	9.7	1,238	20.1	10.4	13.7	6.5	6.6	7.4	4	3.1	16.2	79	65	68	22

* The ring frame front roller diameter used in these tests has a diameter of ¾ inch.

(c) MADRAS AND AMERICAN COTTONS.

Sample No.	Cotton.	Season.	Counts Nominal.	Waste Percentages. Blow Room Loss.	Card Room Loss.	Spinning Loss.	Total Loss.	Ring Frame Particulars* Yarn Breakages per 100 spindles per hour.	Speed Front Roller R. P. M.	Draft.	Turns per Inch.	Yarn Test Results. Lea. Counts Actual.	Strength (lbs.)	Strength Irregularity (%).	Count-Strength Product.	Single Thread. Counts.	Strength (ozs.)	Strength Irregularity (%).	Weakness Percentage.	Extension (%).	Extension Irregularity (%).	Evenness Class.	Nops per Yard.	Turns per Inch Actual.	Temperature (°F.) Spinning Room.	Relative Humidity (%). Spinning Room.	Testing Room.	Highest Standard Warp Counts.
105	Co. 1 (998)	1923-24	20	4.4	6.9	0.0	11.0	15	181	4.21	16.85	19.7	84.9	9.1	1,667	..	10.8	11.4	3.2	4.4	18.1	2	1.12	..	86	72	61	32
86	,,	1924-25	20	4.2	7.2	0.4	11.8	7	182	4.39	16.85	19.7	82.7	7.2	1,628	..	11.0	7.7	0.2	5.0	8.2	2	1.12	..	84	74	64	32
126	,,	1925-26	20	4.6	6.6	0.4	10.6	2	182	4.39	16.85	19.6	83.2	4.8	1,713	..	11.8	7.7	0.2	6.0	8.2	2	2.3	..	92	63	63	32
235	,,	1926-27	20	3.7	7.2	0.4	11.3	2	182	4.54	16.85	19.6	89.5	4.9	1,753	20.2	12.1	8.6	1.0	6.8	8.2	2	2.4	16.2	88	64	63	32
374	,,	1927-28	20	3.7	7.2	0.4	11.3	2	182	4.54	16.85	19.6	89.5	4.9	1,760	20.2	12.1	8.6	1.0	6.8	8.2	2	2.4	16.2	88	64	63	32
496	,,	1928-29	20	4.4	8.4	0.4	13.2	4	182	4.47	16.85	19.5	88.2	4.8	1,728	19.7	12.1	8.6	1.0	6.8	8.2	2	1.8	16.2	88	64	63	32
76	Co. 2 (440)	1924-25	20	2.8	11.6	1.1	15.5	22	182	4.08	16.85	19.8	82.2	8.8	1,648	..	12.2	7.3	0	4.9	5.6	..	..	..	86	72	58	28/30
121	,,	1925-26	20	2.8	10.4	0.5	13.7	3	182	4.08	16.85	19.8	82.2	8.8	1,628	..	10.1	10.9	1.0	5.7	7.8	..	..	..	86	68	63	24/28
269	,,	1926-27	20	3.7	9.6	0.4	13.2	2	182	4.44	16.85	19.6	87.1	3.4	1,708	19.6	12.0	8.5	2.6	7.5	7.8	..	4.4	16.5	88	68	68	28/30
375	,,	1927-28	20	3.7	9.4	0.4	13.5	2	182	4.44	16.85	19.6	87.1	3.4	1,708	20.0	12.0	10.5	2.6	7.5	7.8	..	8.4	16.2	88	68	68	28/30
503	,,	1928-29	20	3.9	9.6	0.4	13.9	2	182	4.44	16.85	19.4	84.5	4.8	1,661	20.2	9.0	12.3	6.6	6.8	8.6	..	6.7	16.1	86	71	68	28/30
79	Nandyal 14	1924-25	20	5.9	7.5	0.9	13.7	16	188	4.88	16.85	19.9	86.8	6.0	1,605	..	13.8	11.2	3.2	5.9	9.5	..	1.8	..	84	73	57	32
74	,,	1924-25	20	8.2	8.1	0.8	16.1	2	182	4.33	16.85	19.7	84.5	5.6	1,661	..	11.8	9.7	1.5	5.9	8.2	..	1.8	..	84	74	57	32
122	,,	1925-26	20	6.5	9.8	0.4	16.7	2	182	4.33	16.85	19.6	77.2	9.5	1,513	..	11.8	7.7	1.5	5.9	8.2	..	1.8	..	84	74	57	32
278	,,	1926-27	20	3.8	8.6	0.6	13.0	2	182	4.65	16.85	19.6	88.7	5.5	1,738	19.6	12.0	10.9	3.6	6.0	8.2	..	4.5	16.2	88	68	68	30
376	,,	1927-28	20	3.8	8.6	0.6	13.0	2	182	4.65	16.85	20.0	88.7	5.5	1,774	20.2	12.0	10.9	3.6	6.0	8.2	..	4.5	16.2	88	68	68	30/32
506	,,	1928-29	20	4.5	9.2	0.6	13.7	2	182	4.65	16.85	20.2	78.7	7.4	1,610	20.9	11.5	13.6	6.0	6.0	8.2	..	4.1	16.2	91	68	68	30/32
68	Hagari 1	1924-25	20	4.5	10.9	0.8	14.6	2	182	4.48	16.85	19.6	88.1	4.8	1,629	..	13.3	8.9	1.4	4.8	12.8	..	..	..	84	72	60	30
124	,,	1925-26

APPENDIX I.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the year ended 30th June 1929.

THIS report covers the fourth agricultural year of the Institute of Plant Industry. As the results obtained up to the end of June 1929 and the work in progress, on cotton and associated crops, have been dealt with in detail in a book, published by the Oxford University Press, entitled—*The application of science to crop-production, an experiment carried out at the Institute of Plant Industry, Indore*—copies of which are being distributed to the members of the Central Cotton Committee and to the Contributing States, the present report, in order to avoid repetition, is very brief and deals only with administrative matters.

BOARD OF GOVERNORS.

The fifth and sixth meetings of the Board of Governors took place in the Library of the Institute on 20th December 1928 and 27th January 1929 respectively, when a large amount of business was transacted.

The Secretary reported that since the fourth meeting of the Board the following four States—Barwani, Jhalawar, Bikaner and Jaipur—have joined the Institute. The total annual contributions from these States amount to Rs. 15,000. It was decided that a uniform policy should be adopted in the case of future subscribers and that the annual contribution should, as a rule, be at the rate of Rs. 100 for each lakh of gross revenue with a minimum of Rs. 1,000. In the case of very small States a suitable donation (annual or for a fixed period) will be accepted. In such cases, however, the acceptance of a donation does not imply membership of the Society.

A number of benefactions, of the total value of Rs. 25,498, were received during 1928. These were as follows :—

(*a*) *Holkar State.*—Two donations have been received from the Holkar State. The annual contribution for the year ended 30th September 1928 was increased from Rs. 10,000 to Rs. 15,000. It is hoped that in a short time this temporary increase will be made permanent. This sum of Rs. 5,000 has been utilized to start a trading account for financing the supply of improved implements, seed and so forth. This has proved of the greatest use and it is now possible to conduct these operations smoothly without interfering with the current budget. The Holkar State has also provided, at a total cost of Rs. 9,298, a block of five furnished quarters which will be reserved for the use of officers of the State who visit the Institute.

(*b*) *Glancy Scholarship.*—A scholarship (to be known as the Glancy Scholarship) of the value of Rs. 30 per mensem has been endowed by H. H. the Nawab of Jaora to commemorate the term of office of Sir Reginald Glancy, K.C.I.E., C.S.I., I.C.S., Agent to the Governor-General in Central India and the first President of the Governing Body. This scholarship will be tenable for one year and will be open to candidates from the Contributing States in Central India and Rajputana who intend to farm their own land.

(*c*) *Irwin Studentship for the agronomy of cotton.*—To commemorate the visit of H. E. Lord Irwin to the Institute on 29th July 1928, Sir Sarupchandji Hukamchand of Indore has contributed the sum of Rs. 4,000 for an all-India studentship of Rs. 150 per mensem for two years for the study of the agronomy of cotton. This will be open to distinguished science graduates of the Indian Universities.

It was decided that these and any future scholarships and studentships should be awarded by the Director, subject to the approval of the President, the former of whom should be entrusted with the duty of framing suitable regulations in all such cases.

(*d*) *Lending Library.*—A sum of Rs. 500 has been contributed to the new lending library by the following: Raja Gobind Singh of Jaipur, Khan Saheb Illava and Mr. R. S. Patel. The lending library has been started and is proving of great use. Funds are now needed for its expansion.

(*e*) *Hyderabad (Deccan).*—The Government of H. E. H. the Nizam of Hyderabad has contributed a donation of Rs. 500 as a fee for the training of a member of the staff of the State Agricultural Department. It was decided that this sum shall be devoted to the lending library.

(*f*) *General Library.*—An anonymous donor has presented to the Library (through the Secretary, Royal Society of Arts, London) a run of nineteen unbound volumes of the *Journal of the Royal Society of Arts* on condition that the volumes be bound and kept together in the Institute. The Secretary of the Society has very kindly arranged for the binding of these volumes in London and their despatch to Indore.

(*g*) *Vernacular publications.*—Raja Gobind Singh, Jaipur, has given the sum of Rs. 100 for vernacular publications. This will be used for preparing Hindi summaries for the next cultivators' meeting. Dewan Bahadur Sardar Pandit Narayan Prasad, Minister, Dewas S. B., has also contributed a sum of Rs. 100 for publications in the vernacular.

The Secretary was authorized to send suitable letters of thanks on behalf of the Governing Body to all the above donors and to maintain a list of benefactions in the Library of the Institute.

The incorporation of the Institute, under the Societies Act, was carried out on 25th July 1928. The Memorandum of Association and the rules have been printed and circulated to the subscribers. The funds of the Institute are now kept in the Imperial Bank, payments are made by cheque and the accounts are audited on the spot every three months by a firm of Chartered Accountants who also, at the Director's request, pay occasional surprise visits. All matters connected with accounts, audit and stores are now working economically, expeditiously and smoothly and the adoption of business methods has more than justified expectations.

During the year under report, the Governing Body of the Institute lost the valuable services of its first President, Sir Reginald Glancy, who retired from the post of Agent to the Governor-General in Central India in March 1929. He presided at all the six meetings held during his period of office and the Institute owes him a debt of gratitude for much kindly assistance and support.

Visit of H. E. The Viceroy.

His Excellency Lord Irwin and staff visited the Institute on 29th July 1928 and spent the afternoon in going through the various sections in detail. To commemorate this visit, one of the merchant princes of India—Sir Sarupchand Hukamchand of Indore—has founded the Irwin Studentship for the agronomy of cotton.

Training.

During the year three students, nominated by the Central Cotton Committee—Messrs. Thakur, Mathur and Rane—completed their training at Indore. Of these Messrs. Thakur and Mathur have obtained suitable appointments. Mr. Kanti Raj, an agronomy student of the Central Cotton Committee, obtained during his first year an important appointment under the Director of Agriculture, Madras, and was permitted to resign his studentship.

The number of officers sent by the Contributing States for training at the Institute is now increasing and this branch promises to become an important feature of the work,

During the year the Holkar State decided to pass the whole of their *amins* (*tahsildars*) —33 in number—through the Institute in batches of five so that they may be acquainted with the work in progress and may be of assistance in the re-making of the villages of the State. These men are given a special course during August of each year and again visit the Institute for a few days each cold weather. This new departure is already beginning to bear fruit. The number of cultivators and cultivating zamindars who come to see the Institute is steadily growing. Some of these stay a few days to learn for themselves various items of the work.

To meet the demand for agricultural officers from the Contributing States, three new training posts in agronomy have been added to the staff. The competition for these appointments is very keen and a good type of candidate is coming forward. The arrangements for training in the agronomy of cotton and associated crops are now in full working order and promise well.

Financial Statement, 1928-29.

The following tables deal with the income and expenditure of the Institute for the year ended 31st March 1929. The accounts of the year have been audited by Messrs. Ferguson & Co., Bombay, who agree that the financial statement is a correct one.

Income.

	Rs. a. p.	Rs. a. p.
Opening balance on 1st April 1928		3,642 8 2
Permanent advance		2,000 0 0
Receipts during 1928-29 from—		
Central Cotton Committee, Bombay	1,30,000 0 0	
Contributing States	29,305 7 0	
Leased area	7,717 6 8	
		1,67,022 13 8
Donations received—		
Holkar State for construction of Holkar State quarters	8,458 0 0	
Lending library	400 0 0	
Vernacular publications	100 0 0	
		8,958 0 0
Total ..		1,81,623 5 10

Expenditure.

Recurring expenditure	1,49,570 6 10	
Capital expenditure (4th group)	24,794 10 7	
		1,74,365 1 5
Advance to Trading Account		5,000 0 0
Closing balance		2,258 4 5
Total ..		1,81,623 5 10

Recurring Expenditure for 1928-29.

Head of Charge.	Revised Budget.	Expenditure up to date 31-3-1929.	Variations.	
			Increase.	Decrease.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. *Pay and allowances of officers and staff.*				
Director's pay and passage pay	30,092 11 0	29,953 15 9	..	138 11 3
Director's house allowance	1,950 0 0	1,800 0 0	..	150 0 0
2nd Imperial Economic Botanist's pay	18,634 7 0	18,668 6 0	33 15 0	..
Leave and pension contributions—officers, including Director's leave salary and Provident Fund	14,403 6 3	14,551 3 3	147 13 0	..
Pay of staff	26,430 10 0	26,644 8 3	213 14 3	..
Leave and pension contributions—staff	1,291 0 0	1,291 2 0	0 2 0	..
Provident Fund of staff ..	750 8 1	592 1 4	..	158 6 9
Medical attendance on staff	475 0 0	507 8 0	32 8 0	..
Travelling allowance of staff and officers ..	5,000 0 0	4,891 7 6	..	108 8 6
Total ..	99,027 10 4	98,900 4 1	428 4 3	555 10 6
2. *Contingencies.*				
Rent of land	400 0 0	375 0 0	..	25 0 0
Fire insurance and protection	540 12 0	1,535 14 0	995 2 0	..
Audit expenses	1,700 0 0	1,351 5 6	..	348 10 6
Farm expenses	29,800 0 0	31,885 14 2	2,085 14 2	..
*Purchase and upkeep of machinery	1,500 0 0	2,175 1 6	675 1 6	..
Laboratory apparatus and chemicals	3,000 0 0	1,837 15 6	..	1,162 0 6
Books and periodicals ..	4,914 0 0	5,074 14 4	160 14 4	..
Miscellaneous expenses ..	5,566 0 0	5,302 14 9	..	263 1 3
Publications	1,276 0 0	585 4 6	..	690 11 6
Unforeseen expenses ..	575 0 0	545 14 6	..	29 1 6
Total ..	49,271 12 0	50,670 2 9	3,917 0 0	2,518 9 3
Grand Total ..	1,48,299 6 4	1,49,570 6 10	4,345 4 3	3,074 3 9

* Increase due to the purchase of an elevator for Rs. 1,506-10-0.

Capital Expenditure (Fourth Group) 1928-29.

	Revised Budget.	Expenditure to end of March 1929.	Variations. Increase.	Variations. Decrease.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Quarters for visiting assistants, cultivators and labourers	21,567 0 0	21,567 4 0	0 4 0	..
Shelving in two rooms ..	945 0 0	945 0 0	..	..
Enclosing portion of verandah of new laboratory block for a new store-room ..	416 10 7	416 10 7	..	..
New table in chemical laboratory	90 0 0	78 0 0	..	12 0 0
Fixing exhaust fan in dark room	100 0 0	..	..	100 0 0
Hindi typewriter	400 0 0	400 0 0	..	..
Fencing	184 0 0	184 0 0	..	..
Additions to staff quarters .	427 15 0	427 15 0	..	..
Furniture for rest-house ..	685 13 0	775 13 0	90 0 0	..
Total ..	24,816 6 7	24,794 10 7	90 4 0	112 0 0

CAPITAL COST OF THE INSTITUTE.

The Institute is now completed and it is possible to draw up a statement giving details of the total capital cost. This amounts to a little over three lakhs of rupees. The detailed figures, in rupees and sterling (one rupee = one shilling and six pence) are as follows :—

Capital Cost of the Institute.

	Rupees.	*Sterling.*
	Rs. a. p.	£ s. d.
Compensation to the Indore Darbar for buildings and wells	10,078 3 0	775 3 11
Laboratories and farm buildings	1,08,079 5 6	8,313 12 8
Quarters for visitors, labourers and watchmen	30,931 14 0	2,379 6 0
Alterations to staff quarters..	6,005 4 3	477 5 3
Furniture and fittings	40,268 8 7	3,097 9 3
Fencing	14,908 4 0	1,146 12 7
Two wells with engines and pumps	11,926 14 3	894 10 4
Roads	32,847 1 0	2,463 8 11
Pot culture house	4,297 1 0	322 3 11
Ginning factory and gins	8,046 14 0	603 10 1
Apparatus and chemicals	17,504 8 11	1,312 16 10
Electrical installation and motors	6,985 3 0	523 17 9
Bullock gear set	1,203 15 7	90 6 0
Seed bins and drying boxes	660 1 0	49 10 1
Seed drying sheds	3,934 15 0	295 2 6
Neemuch stone threshing and drying floors	2,126 3 0	159 9 3
Work cattle	6,558 12 3	486 18 1
Book-binding	1,968 13 4	147 13 2
Total ..	3,08,331 13 8	23,538 16 7

(Sd.) A. HOWARD,
Director, Institute of Plant Industry, and Agricultural Adviser to States in Central India and Rajputana.

INDORE, 30*th June* 1929.

APPENDIX II.

THE HYDERABAD COTTON CULTIVATION AND TRANSPORT ACT.

No. 6 of 1337 Fasli.

(*Received assent of H. E. H. the Nizam on the 10th Bahman 1338 Fasli.*)

Preamble.

WHEREAS it is expedient for the purpose of maintaining the quality and reputation of cotton grown in certain areas in H. E. H. the Nizam's Dominions to prescribe restrictions regarding cultivation and transport of cotton and to control its import, it is hereby enacted as follows :—

Short title, extent and date of commencement.

(1) This Act may be called " The Hyderabad Cotton Cultivation and Transport Act " and will come into force in H. E. H. the Nizam's Dominions from the date of its publication in the *Jarida*.

Definitions.

(2) In this Act, unless there is anything repugnant in the subject or context :—

(*a*) " Certified copy " in relation to a license means a copy of the license certified in the manner described in Section 62 of the Hyderabad Evidence Act, No. 2, 1313 F., by the authority by which the license was granted.

(*b*) " Cotton " means every kind of unmanufactured cotton, that is to say, ginned and unginned cotton, cotton waste and cotton seed.

(*c*) " Cotton waste " means droppings, strippings, fly and other waste products of a cotton-mill other than yarn waste.

(*d*) " License " means a license granted under this Act.

(*e*) " Notified station " means a railway station specified in a notification issued under Section 3.

(*f*) " Prescribed " means prescribed by rules made under this Act ; and

(*g*) " Protected area " means an area in which the import of cotton or of any particular kind of cotton has been prohibited by a notification under Section 3.

Power to issue notification prohibiting import of cotton into protected area.

(3) 1. The Government may, for the purpose of maintaining the quality and reputation of cotton grown in any area of H. E. H. the Nizam's Dominions, by notification prohibit the import of cotton or of any specified kind of cotton into that area, save under, and in accordance with, the conditions of a license.

Provided that no such notification shall be deemed to prohibit the import into the protected area of cotton not exceeding five seers.

2. Any such notification may prohibit the delivery to, and the taking of delivery by, any person at any specified railway station situated in the protected area, of any cotton the import of which into that area is prohibited, when such cotton has been consigned from a railway station not situated in that area, unless such person holds a license for the import of the cotton into that area.

(4) 1. Notwithstanding anything contained in the Hyderabad Railway Act No. 3 of 1334 Fasli or any other law for the time being in force the Station Master of any railway station or railway servant responsible for the booking of goods or parcels at that station, may refuse to receive for carriage at, or to forward or allow to be carried on the railway from, that station any cotton consigned to a station notified under this Act or the British Indian Act or any Act in force in any Indian State being cotton of a kind of which the delivery at such notified station has been prohibited unless both stations are in the same protected area, or unless the consignor produces a certified copy of a license for the import of the cotton into the protected area in which such notified station is situated.

Refusal to carry unlicensed cotton.

2. Every certified copy of a license when so produced shall be attached to the invoice or way-bill as the case may be and shall accompany the consignment to its destination and shall then be dealt with in the prescribed manner.

3. Where, by or under any law in force in British India or in any Indian State, the import into any area of ginned or unginned cotton, cotton waste or cotton seed has been prohibited, H. E. H. the Nizam's Government may by notification declare that cotton grown in that area may, subject to reasonable conditions, be imported by road or rail into any protected area in H. E. H. the Nizam's Dominions.

(5) Where any cotton, the import of which into any protected area has been prohibited, arrives at a notified station in any such protected area, the Station Master or other railway servant responsible for the receipt or delivery to the consignee of goods or parcels, as the case may be, at that station, shall unless both the notified stations and the railway station from which the cotton has been consigned are situated in the same protected area, refuse to deliver the cotton until he is satisfied that the consignee holds a license for the import of cotton into the protected area in which such notified station is situated and, if he is not so satisfied or if within fourteen days the consignee or some person acting on his behalf does not appear in order to take delivery, shall return the cotton to the railway station from which it was consigned together with an intimation that delivery of the cotton has been refused or has not been taken, as the case may be.

Procedure where cotton arrives at notified station.

2. Any Station Master or other railway servant receiving any cotton returned with the aforementioned intimation from a railway station specified in a notification under sub-section (3) of Section 4, or returned under sub-section (1) shall cause to be served on the consignor a notice stating that the cotton has been so returned and requiring a consignor to pay any terminal or other charge due in respect of the carriage of cotton to and from the railway station to which it was consigned, and such charges shall be deemed to be as due from the consignor for the purposes of Section (25) of the Hyderabad Railway Act No. 3 of 1334 Fasli.

(6) 1. In any area regarding which a notification under Section (3) has been issued, H. E. H. the Nizam's Government may by notification order that only cotton of a specified type shall be grown.

Growing of cotton of a specified type in the protected area.

2. After the issue of the notification under sub-section (1) regarding any area, any person growing any other type of cotton shall, on complaint authorized by the Director of Agriculture before any Magistrate of First Class, be liable on conviction to a fine which may extend to Rs. 50 (Rupees fifty) and the forfeiture of the cotton grown.

3. In every village situated in such area, Government shall before the season of sowing offer to supply seed of the specified type at a rate approved by the Director-General of the Agriculture Department each year which shall not be higher than the market rate.

(7) Any person, who in contravention of the provisions of this Act, or of any notification or rule made hereunder, knowingly takes delivery of any cotton from a notified station or imports or attempts to import, any cotton into a protected area, and any Station Master or other railway servant,

Penalties.

who in contravention of the provisions of sub-section (1) of Section 5, without reasonable excuse, the burden of proving which shall lie upon him, delivers any cotton to a consignee or other person, shall be liable to a fine not exceeding one thousand rupees, and upon any subsequent conviction to imprisonment which may extend to three months or to a fine which may extend to five thousand rupees or to both.

Power to make rules.

(8) 1. The Government may, by notification, make rules to provide for any of the following matters :—

(*a*) The prevention of the import into a protected area, save under and in accordance with the conditions of a license of cotton the import of which into that area has been prohibited by a notification under Section 3.

(*b*) The terms and conditions to be contained in licenses and the authorities by which they may be granted ; and

(*c*) The manner in which licenses and certified copies thereof shall be dealt with on and after the delivery of the cotton to which they relate.

2. Any such rules may provide that any contravention thereof or of the conditions of any license, not otherwise made punishable by this Act, shall be punishable with fine which may extend to five hundred rupees.

Protection for acts done under this Act.

(9) No suit or other legal proceeding shall be instituted against any person in respect of anything which is in good faith done or intended to be done under this Act.

RULES UNDER THE HYDERABAD STATE COTTON CULTIVATION AND TRANSPORT ACT No. 6 OF 1337 FASLI.

In exercise of the powers conferred by section 8 of the Hyderabad State Cotton Cultivation and Transport Act No. 6 of 1337 Fasli, the Government of H. E. H. the Nizam is pleased to make the following rules to carry out the purposes of the said Act, namely :—

1. *Licensing authority : Form of application for a license :—*

(*i*) Licenses for the import of cotton into the protected areas will be granted by the Director-General of Commerce, Industries and Agriculture, Hyderabad State, and application shall be made to that officer in Form ' A' annexed to these rules.

(*ii*) The Director-General may by notification in the *Jarida* delegate all or any of his powers under sub-section (*i*) of this rule to any officer of the Agriculture Department not being below the rank of Deputy Director and thereafter applications shall be made to that officer but an appeal against any refusal to grant a license shall lie to the Director-General.

2. No cotton of which the import has been prohibited by or under section 3 of the Hyderabad State Cotton Cultivation and Transport Act No. 6 of 1337 Fasli shall be imported into a prohibited area by road, or river save under and in accordance with the conditions of a license issued as provided by these rules.

3. *Licenses for import of cotton for manufacture :—*

(1) Annual licenses for import by rail shall be granted to manufacturing concerns situated within protected areas for the importation of cotton or of any specified kind of cotton from outside such area for manufacture only. Such licenses shall be in Form ' B ' hereto annexed and shall be subject to the conditions stated therein.

(2) A certified copy of such licenses shall be tendered in Form ' C ' hereto annexed with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for return to the Director-General of Commerce, Industry and Agriculture, Hyderabad.

(3) The license shall be returned to the licensing authority at the expiration of the period for which it is granted together with all unused certified copies of the same.

4. *License for particular consignment by rail :—*

(1) A single license to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, cotton seed, unginned cotton, ginned cotton or cotton waste) into the protected area. Such licenses shall be in Form ' D ' hereto annexed and shall be subject to the conditions stated therein.

(2) Such license shall be surrendered at the station of delivery to the Station Master or other prescribed officer at the time of taking delivery of the cotton covered by the license, who shall forward it to the licensing authority.

(3) A certified copy of such license shall be tendered in Form ' E ' hereto annexed with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for return to the Director-General of Commerce, Industry and Agriculture, Hyderabad.

5. *License for particular consignment by road or river :—*

(1) A single license to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, cotton seed, unginned cotton, ginned cotton or cotton waste) by road or river into the protected area. Such licenses shall be given in Form ' F ' annexed and shall be subject to the conditions stated therein.

(2) Such license shall be delivered at the " Naka," " Ghat " or other places specified by the licensing authority to the officer mentioned in the license who shall forward it to the licensing authority.

6. *Separate licenses to be issued for different kinds of cotton :—*

Separate licenses may be issued for different kinds of cotton, that is to say, for ginned cotton, cotton seed, unginned cotton (*kapas*) and cotton waste.

7. *Penalty :—*

Any contravention of these rules or the conditions of any license, not otherwise punishable under the said Act, shall be punishable on conviction by a Magistrate with fine which may extend to five hundred rupees.

NOTIFICATION.

Whereas it is necessary for the purpose of maintaining the quality and reputation of the cotton grown in the areas in the Hyderabad State mentioned in Schedule I hereto appended.

Now, therefore, in exercise of the powers conferred by sub-section (I) of Section III of the Hyderabad State Cotton Cultivation and Transport Act No. 6 of 1337 Fasli, H. E. H.

the Nizam's Government is hereby pleased to prohibit the import of cotton into the said areas save under and in accordance with the conditions of license presented in this behalf.

(2) The Government of H. E. H. the Nizam is further pleased under sub-section (2) of Section III of the said Act to prohibit the delivery to, and the taking of delivery by, any persons at any of the Railway Stations specified under Schedule II hereto appended of any cotton when such cotton has been consigned from a railway station not situated in the said area unless such person holds the prescribed license for the import of cotton into the said areas.

SCHEDULE I.

Protected Areas.

North.—The southern boundary of Hadgaon taluka of Nander district and the northern boundary of Nirmal taluka of Adilabad district.

East.—The eastern and southern boundaries of Nirmal taluka and the eastern boundaries of Nander and Bidar districts.

South.—The southern boundaries of Bidar and Osmanabad districts.

West.—The Sholapur-Osmanabad road from the point where it enters the Hyderabad State until it enters the Barsi taluka; thereafter the boundary of Barsi taluka until it meets the Barsi-Mominabad road; thereafter the Barsi-Mominabad road until it meets the southern boundary of Bir district; thereafter the western and northern boundary of Mominabad taluka until it meets the southern boundary of Parbhani district; thereafter the southern and eastern boundary of Parbhani district until it meets the western boundary of Nander and thence northward along the western boundary of Nander.

SCHEDULE II.

Railway Stations included in the protected areas.

N. G. S. Ry. (M. G.)	*Barsi Light Ry.*
Limbgaon.	Latur.
Nanded.	Hangul.
Mugat.	Ousa Road.
Mudkhed.	Neoli.
Sivangaon.	Murad.
Umri.	Palsap.
Karkheli.	Thair.
Dharmabad.	Dhoki.
Basar.	Tadvale.

No. 2351. *Dated the 25th Bahman* 1337 *Fasli.*

NOTIFICATION.

In exercise of the powers conferred by the Hyderabad Cotton Transport Ordinance, Commerce and Industry Secretariat No. 57 dated the 12th Azur, 1337 F., His Exalted Highness the Nizam's Government are pleased to prescribe the following forms for the grant of licenses to import cotton (ginned cotton, unginned cotton, cotton waste and cotton seed) in the protected area notified under Government notification No. 118, dated 20th October 1927.
14th Azur 1337 Fasli.

Form A. (Application for license.)

Form B. (Annual General License for Mills.)

Form C. (Certified copy of general license for mills to be tendered at despatching stations.)

Form D. (Single license for consignment by rail.)

Form E. (Certified copy of single license for consignment by rail to be tendered at despatching stations.)

Form F. (Single license for consignment by road or river.)

FORM A.

APPLICATION FOR LICENSE.

To

The Director-General of Agriculture,
Industries and Commerce,
H. E. H. the Nizam's Government,
Hyderabad (Deccan).

Sir,

I / We the undersigned hereby beg to apply for a license under the Hyderabad Cotton Transport Act (Act of) available for the period of to for the importation by rail / road / river of bales / maunds of _____ (state whether ginned cotton, unginned cotton (*kapas*), cotton-seed or cotton waste) into the protected area known as notified in at station for the purpose of

I / We also beg to apply for a certified copy of the license (as required by said ordinance).

(2) I / We declare that such unginned cotton / ginned cotton / cotton-seed / waste is required for the purpose of only and will not be otherwise used save under the instructions of the licensing authority.

Reasons why importation is necessary (*a*).

_____

(*a*) Reasons should be clearly stated as licenses are only issued in case of proved necessity.

In the case of applications for licenses to import by road or river, the form should be modified as may be necessary.

(3) I/We undertake :—

(*i*) in the event of the unginned cotton / ginned cotton / cotton-seed / waste imported under the said license proving unsuitable for the purpose for which it is imported, to report the matter to the licensing authority and await his approval to its disposal otherwise before allowing such unginned cotton / ginned cotton / cotton-seed / waste to leave our premises ;

(*ii*) that under no circumstances shall I/we allow unginned cotton / ginned cotton / cotton-seed / waste imported under the said license to be used for mixing with, or adulteration of unginned cotton / ginned cotton / cotton-seed / waste produced in the protected area for re-export nor shall I/we allow it to be re-exported under a misdescription ;

(*iii*) to return the said license on expiration to the licensing authority together with such details as he may require as to the unginned cotton / ginned cotton / cotton-seed / waste imported under it and of its subsequent disposal.

Dated Signed

INSTRUCTIONS.

(1) The Hyderabad Cotton Transport Act does not impose any general restriction on cotton transport, but only on transport into specified areas (notified by His Exalted Highness the Nizam's Government for protection) from places or stations outside those areas. Licenses are only required by concerns situated within the limits of a protected area. Licenses granted under the Hyderabad Cotton Transport Act are available for the importation of cotton from anywhere in the State but only to the places or stations specified.

(2) Cotton as defined in the Act includes ginned cotton, unginned cotton (*kapas*), cotton-seed and cotton waste, but separate licenses are required for each. Separate rules are also in force for the importation into protected areas of cotton by road.

(3) Station masters, at all stations in the State, are empowered to refuse to book cotton to a station in a protected area unless a certified copy of the license is handed in when the cotton is tendered for booking. Each consignment requires a separate certified copy which will accompany the railway invoice to the destination.

(4) Station masters at stations in the protected area are required by the Act to refuse delivery of cotton from outside the protected area, unless accompanied by a certified copy of the license (or unless the original license is produced).

(5) Paragraph 2 in the application form corresponds with condition (*b*) of the license, the object being to safeguard the protected area against the misuse (which might be quite unintentional) of cotton imported under license.

FORM B.

ANNUAL GENERAL LICENSE (FOR MILLS).

Under the Hyderabad Cotton Transport Act (Act of 1338 Fasli) the (Mills), situated in the protected area known as notified are hereby granted a general license under the said Act for the period of to import * to station for the purpose of manufacture subject to the following conditions :—

(*a*) A certified copy of this license shall be tendered with the consignment at the despatching station.

(*b*) Cotton imported under this license shall not be used except for the purposes, stated above, save under the instructions of the undersigned.

Director-General,
Commerce and Industry Department.

Dated 192

FORM C.

CERTIFIED COPY OF GENERAL LICENSE (FOR MILLS) TO BE TENDERED AT DESPATCHING STATIONS.

License No. 192 . Copy No.

Under the Hyderabad Cotton Transport Act (Act of 1338 F.) the (Mills) situated in the protected area known as and published in are hereby granted a general license under the said Act for the period of to import † to station for the purpose of manufacture subject to the following conditions :—

(*a*) A certified copy of this license shall be tendered with the consignment at the despatching station.

(*b*) Cotton imported under this license shall not be used except for the purposes, stated above, save under the instructions of the undersigned.

Director-General,
Commerce and Industry Department.

Name of Consignor.
Number of bales.
Description of cottons.

Signature of Consignor.

Dated 192 . Signature of Station-Master.

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* Here enter ginned cotton, cotton waste, unginned cotton or cotton-seed for which license is granted.

† Here enter article.

FORM D.

SINGLE LICENSE (FOR CONSIGNMENT BY RAIL).

Under the Hyderabad Cotton Transport Act (Act of 1338 F.) Messrs. / Mr. are / is granted a license to import to station situated in the protected area known as bales / maunds notified by Government Notification No. of (a) from (station) for the purpose of .

This license is only valid for one consignment and shall be surrendered to the undersigned, duly endorsed by the Station Master of the station of delivery on the arrival of the consignment :—

(a) A certified copy of this license shall be tendered with the consignment at the despatching station.

Director-General,
Commerce and Industry Department.

Dated 192 . / 133 F.

FORM E.

CERTIFIED COPY OF THE SINGLE LICENSE FOR CONSIGNMENT BY RAIL.

Under the Hyderabad Cotton Transport Act (Act of 1338 F.) Messrs. / Mr. are / is granted a license to import to station situated in the protected area known as notified by Government Notification No. bales / maunds of (a) from (station) for the purpose of

This certified copy is valid for only one consignment and shall be tendered with the consignment at the despatching station.

Cotton imported under this license shall not be used except for the purposes stated above, save under the instructions of the undersigned.

Director-General,
Commerce and Industry Department.

Dated 192 . / 133 F.

This certified copy should accompany the invoice to railway audit and should be despatched from there to the Director-General, Commerce and Industry Department.

(a) State whether ginned cotton, cotton waste, unginned cotton or cotton-seed.

FORM F.

SINGLE LICENSE FOR CONSIGNMENT BY ROAD AND RIVER.

Under the Hyderabad Cotton Transport Act (Act of 1338 F.) Messrs. / Mr. are / is granted a license to import to

situated in the protected area known as notified by Government Notification No. bales / maunds of from for the purpose of

This license is only valid for one consignment and shall be surrendered to the officer in charge of the at on the arrival of the consignment :—

(*a*) Cotton imported under this license shall not be used except for the purposes stated above, save under the instructions of the undersigned.

Director-General,
Commerce and Industry Department.

Dated 192 . / 133 F.

APPENDIX III.

THE HYDERABAD AGRICULTURAL MARKETS BILL.

A Bill to provide for the establishment and the better regulation of agricultural markets in H. E. H. the Nizam's Dominions.

Preamble.

WHEREAS it is expedient to provide for the establishment of recognized open markets for the purchase and sale of cotton and other agricultural produce in H. E. H. the Nizam's Dominions, and for the better regulation of such markets and for the currency to be used in all transactions in such markets. It is hereby enacted as follows :—

Short title.

1. This Act may be called the Hyderabad Agricultural Markets Act.

Extent.

2. This Act shall apply to the whole of H. E. H. the Nizam's Dominions.

Definitions.

3. In this Act, unless there is anything repugnant in the subject or context :—

Agricultural produce.

(*i*) "Agricultural produce" means the produce of any land not being cotton, which is declared by H. E. H. the Nizam's Government by a notification in the *Jarida* to be agricultural produce for the purpose of this Act.

Cotton.

(*ii*) "Cotton" includes ginned cotton, unginned cotton and cotton waste.

Market.

(*iii*) A "Market" means a market established under Section 4.

Prescribed.

(*iv*) " Prescribed " means prescribed by rule or by-laws made under this Act.

Notification of an agricultural produce or cotton market.

4. (1) H. E. H. the Nizam's Government may by notification in the *Jarida* declare that any place shall be a market established under this Act either for agricultural produce or for cotton or for both.

(2) Every such notification shall define the limits of the markets so established and may for the purposes of this Act include within such limits such local areas the Government may prescribe.

The market committee.

5. For every market there shall be a market committee. The market committee shall be constituted as prescribed and shall consist of not less than eight and not more than 16 members. Of these not less than half shall be persons elected by or nominated from among the growers of agricultural produce or cotton of such area as H. E. H. the Nizam's Government may prescribe. Not less than one-fourth shall be elected by the traders in the market in such manner as may be prescribed and the remainder shall be nominated by Government.

Rules.

6. (1) Government may, either generally or specially for any market or group of such markets make rules consistent with this Act for the purpose of the management and regulation of such markets under this Act.

(2) In particular and without prejudice to the generality of the foregoing power, such rules may provide for or regulate :—

(*i*) the election and nomination of members of the market committee, the number of members to be nominated or elected by each of the bodies in accordance with Section 5, and the manner of nomination or election and the term of office of such members ;

(*ii*) the powers to be exercised by the market committee ;

(*iii*) the filling of casual vacancies in the offices of members or in the office of chairman of the market committee ;

(*iv*) the management of the market and the prescribing of fees by the market committee, and, subject to the provisions of this Act, the collection and disposal of such fees ;

(*v*) the issue by the market committee of licenses to brokers, weighmen, measurers, surveyors and warehousemen and other persons using the market, the form in which, and the conditions under which such licenses shall be issued, and the fees to be charged for such licenses ;

(*vi*) the place or places at which cotton or agricultural produce shall be weighed or measured, and the kind and description of the scales, weights and measures to be used at such place or places ;

(*vii*) the periodical inspection, verification and correction of all scales, weights and measures in use in the market ;

(*viii*) the trade allowances which may be made or received by any person in any transaction in a market ;

(*ix*) the settlement by arbitration, against which there shall be no appeal, of all disputes between a buyer and seller of cotton or agricultural produce or their agents regarding the quality or weight of the cotton or agricultural produce, the price or rate to be paid, the allowances for wrappings, dirt or impurities or deductions for any cause ;

(*x*) the prohibition of brokers from acting on behalf of both the buyer and seller in any transaction;

(*xi*) the manner in which the auctions shall be conducted and bids made and accepted in any market;

(*xii*) the provision of storage arrangements for cotton and agricultural produce;

(*xiii*) the preparation of plans and estimates for works proposed to be constructed partly or wholly at the expense of the market committee and the grant of sanction to such plans and estimates;

(*xiv*) the form in which the accounts of the market committee shall be kept, the manner in which they shall be audited, and the time or times at which they shall be published;

(*xv*) the preparation of an annual budget and its submission for sanction, and the reports and returns which shall be furnished by the market committee;

(*xvi*) the disposal of any surplus funds of the market committee.

(3) Any such rules may, when necessary, provide that any contravention thereof or of any of the conditions of any license issued thereunder shall be punishable with fine which may extend to five hundred rupees.

By-laws.

7. Subject to any rules made by Government under the last preceding section and with the previous sanction of such officer as the Government may designate in this behalf, the market committee may, in respect of the market under its management, make by-laws for the regulation of the business and the conditions of trading in such market and may provide that contravention thereof shall be punishable with fine which may extend to fifty rupees.

Sub-committees and joint committees and delegation of powers.

8. The market committee may appoint one or more of its members to be a sub-committee or to be a joint committee for the conduct of any work or works or to report on any matter or matters, and may delegate to any one or more of its members such of its own powers as may be necessary.

Appointments and salaries of servants of the market committee.

9. (1) The market committee may employ such officers and servants as may be necessary for the management of the market and may pay such officers and servants such salaries as the committee thinks fit. The committee may, in the case of any officer or servant of Government which it employs, pay such pension contribution, gratuity or leave allowance as may be required by the regulations made by Government in this behalf and for the time being in force.

(2) The committee may also, in the case of any of its officers and servants, provide for the payment to them of such leave allowances, pensions or gratuities as it deems proper; and may contribute to any provident fund which may be established for the benefit of such officers and servants.

(3) The powers conferred by this section on the market committee shall be exercised subject to any rules which may be made in this behalf by the Government.

Contracts how executed.

10. (1) Every contract entered into by the market committee shall be in writing and shall be signed on behalf of the market committee by the chairman and two other members of the market committee.

(2) No contract other than a contract executed as provided in sub-section (1) shall be binding on a market committee.

The market committee fund.

11. All moneys received by a market committee shall be paid into a fund to be called the " Market Committee Fund " and all expenditure made by the market committee under or for the purposes of this Act shall be defrayed out of the said fund. Any surplus remaining after such expenditure has been met shall be expended as may be prescribed in the rules made in this behalf.

Purposes for which the market committee fund may be expended.

12. Subject to the provisions of Section 11 all fees collected by the market committee under this Act or the rules made thereunder shall be expended on :—

(*i*) the maintenance and improvement of the market ;

(*ii*) the construction and repair of buildings which are necessary for the purposes of such market and for the health, convenience and safety of the persons using it ; and

(*iii*) the pay, pensions, leave allowances and pensions or provident fund contributions of the officers and servants employed by the market committee.

No trade allowance not recognised by custom or rules allowable.

13. (1) No trade allowance, other than an allowance prescribed by rules or by-laws made under this Act shall be made or received by any person in any transaction in a market established under this Act, and no Civil Court shall, in any suit or proceeding arising out of any transaction in any such market, have regard to any trade allowance not so prescribed.

Explanation.—Every deduction other than deductions on account of deviation from sample, when the purchase is made by reference to a known standard, or on account of difference between the actual weight of the sacking and the standard weight, or on account of the admixture of foreign matter, shall be regarded as a trade allowance for the purposes of this Act.

14. No person may work or be employed as a broker, weighman, measurer, surveyor or warehouseman within the limits of the market unless he is employed by the market committee or has received a license from it, and any person so doing shall be punished with fine which may extend to fifty rupees and should the offence be repeated, to five hundred rupees for the first day and one hundred rupees for each day after the first during which the offence continues.

No private market to be opened in or near places declared to be markets.

15. Wherever H. E. H. the Nizam's Government has by a notification under Section 4 declared any place to be a market, no person shall, within the area of such market and within a distance thereof to be notified in the *Jarida* in this behalf in each case by the Government, except with the sanction in writing of Government expressed over the signature of a Secretary to Government and subject to such conditions as may be imposed in such sanction, set up, establish or continue or allow to be continued any market for the purpose and sale of cotton or agricultural produce as the case may be.

Penalties.

16. Whoever in contravention of this Act, sets up, establishes, continues or allows to be continued any market for the purpose of the purchase and sale of cotton or agricultural produce or violates the conditions under which he has been allowed to set up, establish or continue, any such market, shall be punished with fine which may extend to Rs. 500, and, in case of a continuing breach of the provisions of Section 15, with fine which may extend to Rs. 100 for each day after the first during which the breach continues.

Compulsory use of Osmania Sicca currency.

17. H. E. H. the Nizam's Government may by a notification in the *Jarida* prescribe that in any market in H. E. H. the Nizam's Dominions, whether notified under Section 4 or not, bids for cotton or agricultural produce or payments for the same shall be only made and accepted in Osmania Sicca currency.

(2) Where a notification has been made under this section, any person who shall make or accept a bid or pay for any cotton or agricultural produce or receive payment for the same in any other currency shall, on conviction before a magistrate of the first class, be punishable with fine which may extend to Rs. 100 or to 10 per cent. of the bid made or accepted or the amount paid or accepted, whichever is greater.

Offences to be triable only by First Class Magistrates.

18. (1) No offence under this Act or under any rule made under Section 6 shall be triable by a magistrate other than a magistrate of the First Class.

(2) All fines and damages recovered from an offender shall be paid to the market committee.

(3) Prosecutions under this Act may be instituted by any person duly authorized in writing by the market committee or by some officer designated by Government in this behalf.

(Sd.) G. A. MOHAMMADI,
Officiating Secretary.

STATEMENT OF OBJECTS AND REASONS.

The objects of this Bill cannot be better stated than in the following extract from the report of the Royal Commission on Agriculture in India, which is reproduced below.

" 327. If, as we have held in the preceding paragraph, it is established that the cultivator obtains a much better price for his produce when he disposes of it in a market than when he sells it in his village, the importance to him of properly organized markets needs no emphasis. The importance of such markets lies not only in the functions they fulfil but in their reactions upon production. Well-regulated markets create in the mind of the cultivator a feeling of confidence and of receiving fair play and this is the mood in which he is most ready to accept new ideas and to strive to improve his agricultural practice. Unless the cultivator can be certain of securing adequate value for the quality and purity of his produce, the effort required for an improvement in these will not be forthcoming. The value of the educative effect of well-regulated markets on the producer can hardly be exaggerated but it has yet to be recognized in India. From all provinces we received complaints of the disabilities under which the cultivator labours in selling his produce in markets as at present organized. It was stated that scales and weights and measures were manipulated against him, a practice which is often rendered easier by the absence of standardized weights and measures and of any system of regular inspection. Deductions which fall entirely on him but against which he has no effective means of protest are made in most markets for religious and charitable purposes and for other objects. Large " samples " of his produce are taken for which he is not paid even when no sale is effected. Bargains between the agent who acts for him and the one who negotiates for the purchaser are made secretly under a cloth and he remains in ignorance of what is happening. The broker whom he is compelled to employ in the larger markets is more inclined to favour the purchaser with whom he is brought into daily contact than the seller whom he only sees very occasionally. This inclination to favour the buyer becomes more pronounced when, as not infrequently happens, he acts for both parties.

The importance of properly organized markets.

" 328. The disabilities described in the preceding paragraph which undoubtedly exist in almost every unregulated market in greater or less degree, and are not entirely absent from the regulated markets of Berar, can only be removed by the establishment of properly regulated markets and we hold that the establishment of such markets would confer an immense boon on the cultivating classes of India. It must indeed, in our view, form an essential part of any ordered plan of agricultural development in this country, for only in this way can the work of the agricultural departments be brought to full fruition.

The Berar Market system and the Bombay Market legislation.

The markets of Berar are regulated under the provisions of the Cotton and Grain Markets Law. Markets of the character we have in view will also be established in Bombay when the Act to which we have referred above is brought into operation. The value to the cultivator of the markets in Berar has been brought out in striking fashion by the enquiry into the marketing of agricultural produce in that tract which has recently been conducted by the Indian Central Cotton Committee. It was found that no less than 68 per cent. of the cotton sold in that province was sold in these markets. In the neighbouring district of East Khandesh in the Bombay Presidency, only 8·5 per cent. of the cotton sold was brought into the larger markets. A brief description of the Berar system and of the improvements which the Bombay legislation seeks to graft on it is, therefore, a necessary preliminary to the recommendations we have to make on this important subject.

The restriction of regulated markets to cotton.

" 329. We entirely approve the principle underlying the Berar system of regulated markets and of the very desirable improvements in that system which will be effected by the Bombay legislation, and we recommend that similar markets should be established in other provinces. Such criticisms as we shall have to offer are, in the main, confined to points of detail. The Berar markets are, however, as we have seen, confined almost exclusively to transactions in cotton and the Bombay legislation definitely limits them to that product. The first question which, therefore, arises for consideration is the necessity for this restriction. The object of the Bombay legislation as given in the " Statement of Objects and Reasons " is to secure to the cultivator better prices, fairer weighment and freedom from illegal deductions. If the establishment of regulated markets can secure this in respect of cotton, it can do so equally well in respect of other products such as grain and oil-seeds. It appears desirable to point out that, although the primary object of properly regulated markets may be the protection of cultivators, they have also their uses, from the point of view of the purchaser and the public. The cultivator cannot be held guiltless of malpractices. Tricks of the trade such as the adulteration and mixing of produce are not practised only by the middlemen nor are they by any means confined to cotton. There is no measure more calculated to prevent them, in so far as they are to the seller, than the establishment of properly regulated markets and the buyer is much more likely to obtain satisfactory quality in such markets than by any other method of purchase. We, therefore, recommend that the system of regulated markets should be extended to products other than cotton."

The Bill follows in the main the Bombay Cotton Markets Act, which has recently been passed on the advice and with the approval of the Indian Central Cotton Committee. In view of the recommendations of the Royal Commission, it has been so framed that it will be possible to extend it, when desired, to other agricultural produce beside cotton ; but it is not intended, in the first instance, to go beyond the establishment of cotton markets. The following new features have been introduced into the Bill :—

(*a*) As recommended by the Royal Commission, power is taken to provide for the settlement of disputes regarding the business of the market by arbitration ;

(*b*) on the same recommendation, power is taken to prevent brokers acting both for the buyer and the seller ;

(*c*) on the same recommendation, power is taken to prevent dealers making secret bids ;

(*d*) on the same recommendation, power is taken to regulate the provision of warehouses for the storage of the produce ;

(*e*) as the use of British currency appears to be extending from British India into the Dominions, power is taken to require that only Osmania Sicca shall be used in any market.

(Sd.) G. A. MOHAMMADI,
Officiating Secretary.

APPENDIX IV.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract.*—During the year, the policy of the Agricultural Department to establish 1027 A.L.F. over the whole of the tract south of the river Narbada was continued. Unfortunately, however, the absence of restriction on road imports of *kapas* across the river Tapti from the Olpad-Ankleshwar area into the Surat area is proving a considerable hindrance to the achievement of the objects of this policy. The total area under cotton in Gujerat in the tract south of the Narbada river is 550,000 acres of which nearly 475,000 acres are now under 1027 A.L.F. The remaining area in the Olpad taluka and surrounding tracts is under the old inferior type of cotton Selection Surat 1A and it is feared that the seed of this variety will extend still further unless a check on imports across the river Tapti is put into force.

An area of 11,855 acres of 1027 A.L.F. cotton was grown under the control and supervision of the Agricultural Department and the seed therefrom, amounting to 24 lakhs pounds, was distributed in the tract south of the river Narbada. The Rajpipla State purchased a very large quantity of this seed and distributed it to the cotton cultivators of the State. Similarly the State of Chhota Udepur on the north of the same river distributed 1027 A.L.F. seed to its cultivators.

(2) *The Dholleras Tract.*—The year 1928-29 proved to be very disastrous on account of the occurrence of severe frost towards the end of January 1929. Owing to such vagaries of the season in this tract, which have been similarly experienced in previous years, the rapid multiplication of the seed of improved cotton varieties has proved to be extremely difficult. Out of 20 acres under the improved type Wagad 8, 10 acres were completely destroyed by the frost referred to above and accordingly seed from only ten acres was available for further multiplication. During the current year 2,000 lbs. of seed of Wagad 8, sufficient for sowing about 150 acres, are available for distribution.

The distribution of Wagad 4 seed has been discontinued as the growers, being unable to get full value for the improved quality of this cotton, believe that its cultivation was less profitable than that of the local variety.

(3) *The Kumpta-Dharwar Tract.*—The cultivation of three improved types of cotton known as selected Kumpta (Dharwar No. 1), Upland (Gadag No. 1) and Dharwar No. 1 x Rosea cross was continued round Hubli, Gadag and Bailhongal respectively. The Agricultural Department and the Cotton Sale Societies, Hubli, Gadag and Bailhongal continued to work together in the work of extension. As usual, blocks of reserved areas for seed multiplication were organized, 6,181 acres under Dharwar No. 1 in villages round Hubli, 12,340 under Gadag No. 1 round Gadag and 5,954 acres under Dharwar No. 1 x Rosea, round Bailhongal. The estimated yields of cotton from these three reserved areas were 1,300, 1,500 and 800 bales respectively. Small seed multiplication blocks of 250 and 400 acres were organized at Haveri and Bijapur.

For distribution of general pedigree seed stocked by Cotton Sale Societies, seed depots were started as usual in various selected centres. Some local Associations, notably the Gadag Dalals' Association, and some seed dealers also stocked seed of fairly reliable purity. The total estimated area grown with pure seed was 90,000 acres under Dharwar No. 1, 139,000 acres under Gadag No. 1 and 6,000 acres under Dharwar No. 1 x Rosea cotton, against 177,800, 102,000 and 1,800 acres respectively last year. The total estimated yields were 15,000, 17,000 and 800 bales against 24,000, 15,700 and 300 bales respectively. The fall in the area of Dharwar No. 1 was due mainly to the fact that the Hubli Sale Society, which is the principal body dealing with this cotton, stocked only a limited quantity of seed. Besides, Dharwar No. 1 cotton has been found to be very susceptible to wilt disease and it is intended to replace this cotton by an equally good but wilt-resistant cross Dharwar No. 1 x Dharwar No. 2 which has been newly evolved. This cross was grown on the whole of the Dharwar Farm during the year and it was found to resist wilt

attack to a remarkable degree whereas Dharwar No. 1 suffered very badly from the disease. The seed raised on the farm is sufficient for 1,000 acres and it will be sown in the reserved area round Hubli during the coming season. Upland cotton has become popular round Gadag and its cultivation is increasing. Dharwar No. 1 x Rosea cotton round Bailhongal was observed to mature later than local Kumpta though it was not so on Dharwar Farm. As this is a character disliked by cultivators on account of the danger of late rains, detailed observations will be repeated during the coming season.

All the three improved types of cotton have been well appreciated by buyers who gave on an average Rs. 13 more per *Naga* of seed cotton (1,344 lbs.) for Dharwar No. 1, Rs. 37 more for Gadag No. 1 and Rs. 48 more for Dharwar No. 1 x Rosea cross cotton in auction sales held during the year at Hubli, Gadag and Bailhongal respectively.

(4) *The Khandesh Tract.*—Dhulia No. 1 cotton, which is now termed "Banilla," was distributed in four talukas as the trials carried out on a field scale had demonstrated that the yield of this variety is in no way inferior to that of N. R. variety. This distribution of "Banilla" seed was organized in such a way as to concentrate the cultivation of the improved variety in definite selected areas. During the year, 2,872 acres were sown with this improved cotton. The results obtained this year confirm the fact that Banilla is in no way inferior to N. R. in yield while it is decidedly superior to N. R. in ginning percentage and in spinning value. The average yield obtained was 440 lbs. per acre. The seed obtained, namely, 200,000 lbs., has been distributed in the same talukas. Pure Roseum (N. R.) cotton seed for about 10,000 acres was supplied by the Agricultural Department to Taluka Development Associations for distribution to their members. In addition to this seed, many of these Associations had stocks of their own, supplied by their registered seed growers, and this seed also was similarly distributed. The area sown under these arrangements would amount to nearly 25,000 acres.

MADRAS.—I. *The Southerns Area.*—(*A*) *Cambodia* :—(*a*) *Coimbatore.*

(*i*) The multiplication of the improved varieties of Cambodia cotton began in 1918-19. The Agricultural Department usually enters into yearly contracts with selected ryots and makes advances to them at the rate of about Rs. 15 per acre towards the cost of inter-cultivation operations. The ryots in turn sow the seed supplied by the Department on "Seed farms" under its supervision. The "seed-farm" ryots are grouped into non-credit seed societies. There are ten such societies, six belonging to the Avanashi Union, two to the Perumanallur Union, and two to the Tiruppur Union. The entire *kapas* produced is handed over to the Agricultural Department for ginning, the lint is sold by the Department in public auction on behalf of the ryots, and the seed is bought by the Department at a premium of Rs. 2 per *pothi* of 250 lbs. This seed is distributed to Demonstrators, Co-operative Societies, Unions and to Circle Officers. The advantages of the system are :—

(1) the supply of pure seed of a recognized strain secures for the ryot a higher yield of *kapas* ;

(2) the supply of capital for cultivation expenses enables the grower to free himself from the clutches of money-lenders who are themselves traders, and also enables the grower to dispose of the produce himself at the highest market rate ;

(3) the ginning and marketing by the Department ensure the purity of the strains and the production of the best quality of lint.

(*ii*) An important change during the year in the conditions of agreement with the seed farm ryots, was that the amount of seed issued is to be recovered in kind at the end of the season instead of a free issue being made.

(*iii*) The area under Cambodia cotton seed farms this year was 1,126 acres. This includes an area of 119 acres of Cambodia strain No. 440, now renamed Co. 2. This is the first year in which this strain has been grown under seed-farm conditions. From the

results obtained this year and in previous years, the probability is that the strain would ordinarily give an average yield of 4 *pothies* (1,000 lbs.) of seed cotton (*kapas*) per acre for the season pickings alone. The Central Farm average for this strain over 16 acres this year is nearly 5 *pothies* (1,200 lbs.) while the average figure for the Avanashi area where the best Cambodia is grown is about 3 *pothies* (750 lbs.) for the season pickings. In the coming year it is therefore proposed to replace entirely strain No. 1 (Co. 295) by strain No. 2.

(*iv*) Of the total area of 1,126 acres under seed farms, advances for cultivation expenses were made for 1,076 acres and the ryots cultivated the remaining 50 acres without taking advances and joined the scheme of co-operative ginning and sale under the supervision of the Agricultural Department.

(*v*) 298,545 lbs. of seed including 3,253 lbs. of Co. 2 were available for distribution among the cotton growers for further production—294,437 lbs. contributed by the owners of seed farms, and 3,533 lbs. by the Central Farm, Coimbatore, and 575 lbs. by the Cotton Specialist. Of this quantity, 291,250 lbs. or 97½ per cent. were purchased by the ryots in the Coimbatore District, against 359,988 lbs. of seed purchased in 1927-28.

(*vi*) The season was not favourable for both varieties and seed farms yielded only on the average 407 lbs. of *kapas* per acre under the first picking against the normal of 750 lbs.

(*b*) *Trichinopoly.*—In the Trichinopoly District also ryots used 56,276 lbs. of Cambodia seed, sufficient to sow 5,600 acres—made up of 12,276 lbs. supplied by the Department, 14,000 lbs. of departmental seed supplied by a millowner, and 30,000 lbs. obtained direct from Tiruppur—against 33,830 lbs. to sow 3,383 acres in 1927-28.

(*c*) *Madura.*—19,900 lbs. of seed were distributed among the ryots. 105 acres of Cambodia seed farms have been arranged in the current year in Dindigul, Palni and Periyakulam taluks of the Madura District, to meet the demand for seed from within that district.

(*B*) *Karunganni* :—(*a*) *Coimbatore.*—Karunganni cotton is making headway in the dry lands of Coimbatore District and is displacing dry Cambodia and Uppam. This strain also is being propagated in seed farm areas under contracts with selected ryots as in the case of Cambodia, except that the advance money for inter-cultivation is Rs. 10 per acre (or Rs. 5 less than that for Cambodia). As in the case of Cambodia, free issue of seed was stopped and the seed issued was recovered at harvest. 126,328 lbs. of seed available from the seed farms of 1927-28 were purchased by the Department at a premium of Rs. 2 per *pothi*. 9,570 lbs. were bought from the VI Circle, and 600 lbs. of special strains were supplied by the Cotton Specialist. 128,545 lbs. were distributed among cultivators for sowing, including 9,570 lbs. used for seed farms in 699½ acres, against 107,018 lbs. in 1927-28. An average yield of only 203 lbs. *kapas* per acre was obtained from the seed farms as the season from the start was not favourable for the crop. The advantages in propagating seed under seed-farm conditions referred to above under Cambodia apply to Karunganni also.

(*b*) *South.*—The methods adopted for the propagation of the improved strain of Karunganni, known as Company Cotton, were continued as in previous years, viz., the rapid multiplication of the seed on seed farms and production and sale of lint through agencies like Seed Unions and Co-operative Societies, without the intervention of the Agricultural Department. 98,411 lbs. of seed were obtained from the seed farms of 1927-28 and 6,460 lbs. were supplied by the Cotton Breeding Station, Koilpatti. Of this quantity, 5,574 lbs. were sown in seed farm areas and 91,402 lbs. were sold to the ryots outside these areas for sowing. Besides, one Seed Union sold to ryots independently 21,000 lbs. of seed for sowing. The area under seed-farms rose from 780 acres to 1,005 acres in the year under review. As there was considerable shedding of flowers and immature bolls, on account of unfavourable climatic conditions, the yields obtained were on the average only 100 lbs. of *kapas* per acre for the season's pickings. Departmental strains in varying

degrees of purity are now universal throughout the south, and pure Uppam cotton formerly grown in the Ramnad District now occurs only in mixtures with Karunganni. Karunganni is normally satisfactory for standard warp counts between 20s and 30s.

II. *Northerns and Westerns Area.*—(*A*) *Northerns.*—N. 14 is the important strain for the locality, though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. However, the area under this strain has been almost doubled on account of the higher price paid for it in the market and the favourable character of the season. It was grown on 2,200 acres under seed-farm conditions with the seed supplied by the Department. The total quantity of this seed distributed for sowing was 94,792 lbs. against 89,402 lbs. in the previous year. The total area under this cotton was 23,601 acres, i.e., 9,901 acres more than the area of 13,700 acres brought under cultivation in the previous year. The estimated production of *kapas* was 156 lbs. per acre in the seed farms and 150 lbs. in ryots' fields. Messrs. Binny & Co. are purchasing the lint at a fairly good premium of Rs. 40 per *candy* of 500 lbs. lint.

(*B*) *Westerns* 1.—(*i*) *H. I. Strain.*—This is a new strain which has been evolved by the Department in the Hagari Experimental Station in the Bellary District. It has proved its superiority over H. 25 in the matter of yield and ginning percentage and is equal to it in the quality of lint, etc. It fetched the high premium of Rs. 20 per *candy* of 500 lbs. lint in the previous year. It is therefore becoming very popular in the Westerns tract. The total quantity of the seed distributed for sowing from the 4,311 acres under seed farms in the previous year was 333,326 lbs. The extent sown was 36,196 acres including 7,576 acres of seed farms at Adoni, Bellary and Guntakal. In addition to this, there was a natural spread of 12,426 acres. The total area under H. 1 during the year was therefore 48,622 acres againts 6,453 acres in the previous year. The estimated production of *kapas* was 150 lbs. per acre, in the seed farms and only 125 lbs. in ryots' fields. The ginning outturn was very high and it is therefore expected that there will be a greater demand for this strain next season. The lint was sold at a premium of Rs. 15 per *candy* of 500 lbs. As the market is dull at present, most of the seed farm ryots are holding back their produce.

(*ii*) *H.* 25.—As the replacement of H. 25 by H. 1 is rather slow, H. 25 continues to occupy greater ground and was grown on 121,374 acres in the Bellary District in the year under review. The estimated production was only 100 lbs. *kapas* per acre. The lint of this strain also was sold at a premium of Rs. 15 per *candy* of 500 lbs.

(*iii*) The chief exporting firms continue to sell on types prepared by their own admixture of different varieties (high and low) as the outcome of trade competition and this practice continues to act as a brake on the improvement of cotton in the tract. The quality of cotton is bound to improve much more quickly if the exporting firms could be induced to sell the commodity pure and to advertise the local names of cotton instead of their type numbers. The ryots would then learn to grow the best variety of cotton and to market it pure for sale.

UNITED PROVINCES.—The distribution of A. 19 is being continued on the lines of previous years and the area is expanding rapidly. Indents are being received from all parts of the United Provinces. This cotton has also done well in Rajputana and the area there is increasing widely. The total amount of seed of A. 19 distributed this year from the departmental as well as private stores was 3,413 maunds.

C. 402 and C. 520, the improved cottons of the Botanical Section, fit for spinning yarn of 22 and 12 counts respectively, are being tried in the canal irrigated areas and the unirrigated parts of the United Provinces.

Seventy bales of C. 402 were raised in 1928-29 through the cultivators and the lint was sold at about the same price as can be got for Broach. After testing this cotton in spinning mills it has been found that C. 402 can replace Punjab-American cotton. C. 520 is a high-yielding, medium-stapled cotton. This is being tried in the rain-sown areas as it matures earlier than other cottons and gives a high outturn per acre.

THE PUNJAB.—The rains during July and the first half of August were generally scanty except in the montane and sub-montane districts. Heavy rainfall in the latter half of August and the first week of September proved beneficial to the crop except in riverain tracts and low-lying areas of some districts where heavy floods and rains did considerable damage to the cotton crop. The weather during the remainder of September and October was generally dry. Cotton was damaged by boll-worm and *tela* in many districts. The attack of the former was more severe during this year than in any year recently. Due to these causes and to adverse climatic conditions the crop was generally below normal throughout the province. Both *desi* and American cotton were widely and severely affected.

The total area under American cotton was reported in the final forecast to be 960,800 acres as compared with 757,700 acres in the preceding year. Of this area 4F was grown on 766,645 acres.

The 285F variety, a later selection, was grown on a small area whilst 289F, a still later selection, was reported to have been grown on 1,200 acres.

At Lyallpur work continued on the selection of types of American cotton with a view to produce improved strains. One new selection offers promise and will be tested on a field scale during *Kharif* 1929. Work on the evolution of new cottons by crossing has also been taken in hand.

Systematic and detailed records of cotton plants and the meteorological conditions which obtain at Lyallpur were taken. These records should materially assist in the solution of the periodical partial failures which have occurred in the Punjab-American cotton crop.

Work on indigenous cottons has been continued and the area under *G. indicum* Mollisoni selection in 1928-29 was 368,587 acres as compared with 266,000 acres in 1927-28. The increase in area is mainly due to American crop having suffered from the vagaries of climate and attacks by pests and through the practice of mixing it with *desi*. The area under *G. neglectum* var. Roseum selection of *desi* cotton, which is grown in the South-east Punjab, was reported to be 181,744 acres. The total area under *desi* cotton for the year 1928-29 was 1,531,900 acres as compared with 1,090,300 acres in 1927-28.

CENTRAL PROVINCES AND BERAR.—The new Verum cotton 262 is rapidly increasing in popularity. The cultivator has begun to recognize its suitability, particularly on wilt-infested land, on which its yield, on account of resistance to this disease, exceeds that of other varieties. Even on land not infected with wilt, the yield obtained from this variety approximates to that of Roseum, so that the premium it can command on account of its superior lint should compensate for a somewhat lower yield. About 460,000 lbs. of seed of this cotton, sufficient to sow 35,000 acres, during the current year have been distributed under departmental control. The Local Government has placed a sum of Rs. 2,00,000 at the disposal of the Director of Agriculture, to be used as an advance to cultivators requiring financial assistance; and a scheme for the controlled marketing of this cotton is at present under his consideration.

BURMA.—In the Myingyan Circle the *kapas* produced from the seed of Pwinbyu Wagale, an improved *Wagale* cotton, amounted to 135,000 *viss* last year and sufficient seed of this strain to sow 6,000 acres was distributed during the season 1928-29. The Department's re-selected strain C-19, the distribution of which began last year, gave a ginning percentage of 38, which is 7 per cent. more than that of the unselected crop. This strain is also more prolific and in great demand wherever it has been tried.

In the West Central Circle Cambodia continues to be cultivated in a small area in the Thayetmyo District and has also been taken up on about 100 acres along the banks of the Mon River in the Minbu District. In the Thayetmyo District 70,000 pounds of selected Wagyi seed were distributed through the agency of the District Agricultural Committee.

In both the circles a number of selected strains and hybrids, some of which appear to be promising, are kept under observation and studied.

HYDERABAD STATE.—H. E. H. the Nizam's Government are making wide efforts to rehabilitate the reputation of the Hyderabad *Gaorani* (Moglai) cotton. The Hyderabad Cotton Cultivation and Transport Act is a great stride forward in this direction, as under this Act, not only the importation of inferior cotton into a protected area can be prohibited, but also the cultivation in that area of any variety other than the approved one can be penalized. Fully supported by such legislation, the Agricultural Department is now striving hard to eradicate the inferior white-flowered Neglectum Roseum cotton from a protected zone comprising the districts of Nander, Bidar and parts of Bhir and Oosmanabad and the Nirmal Taluka of Adilabad District and to establish in its place the superior yellow-flowered *bani* cotton for which that tract was once very famous. This is now being accomplished in two ways. In the first place, large quantities of the famous *Umri* cotton seed are purchased by the Department outright and distributed to the cotton growers in the protected zone from nine seed depots located in suitable centres. Last year 48¼ lakhs lbs. of cotton seed were thus purchased and given to cultivators on Takkavi loan system and the area sown with this seed was 258,452 acres. The second method consists in roguing out all white-flowered plants from an area of 1,500 acres in the village of Bhaisa in the Nander District where it has been found that the quality of *Gaorani* is very good and almost pure, and the superior seed thus obtained is being distributed for sowing in other villages.

BARODA STATE.—In the Navsari District the Agricultural Department concentrated its attention, as usual, on the work of extension of 1027 A.L.F. cotton. As the frost of January last caused heavy damage to the cotton crop, and reduced the supply of suitable seed for sowing, the Department had to organize four seed depots in the district in addition to the three depots then existing for the distribution of pure seed. Pure seed of 1027 A.L.F. distributed from these depots amounted to 153,058 lbs.

Though trials with Broach 9-1 cotton, a selection of the Bombay Agricultural Department, had given very satisfactory results in the Baroda District during the last three years on account of its earliness, the cultivation of this variety was discouraged under advice from the Bombay Department of Agriculture because of the greater susceptibility to wilt.

The damage caused by the frost in the Kadi District also necessitated the organization of the supply of pure seed for sowing during the next season. Accordingly the Department established five distributing centres in the district from which 1,140 maunds of pure Wagad seed, obtained from Mandal, was given out.

An attempt is being made by the Suba Saheb of Amreli District to ensure the supply of guaranteed seed in the district. This year he obtained 18,000 lbs. of pure seed from Khandesh.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 A.L.F.) as a pure crop throughout the State. No other variety is permitted to be grown in the State and its purity is maintained by the annual distribution of selected seed, obtained by special arrangement with the Bombay Department of Agriculture, by the Cotton Transport Act and by control of the ginning and pressing factories. This year, as a result of the special effort made by the State to secure for sowing the best 1027 A.L.F. seed available in Surat, Navsari and Bardoli, an exceptionally good crop both in yield and quality would have been obtained, had not the January frost caused a certain amount of damage in some of the *talukas*. The portion of the crop which was early and hence unaffected or slightly affected by frost fetched the very best prices. As the crop in the Surat District was late and affected by frost the State has arranged to preserve the best local seed for sowing during the next season. Rajpipla cotton has for some time past been recognized as equal to the best type of Surat cotton, and is much sought after.

MYSORE STATE.—As compared with the British provinces in India, the area under cotton in Mysore State is relatively small but there are a few important representative varieties cultivated.

Amongst *deshi* cottons, the most important is "Kumpta" cotton (*G. herbaceum*) grown in large areas in the northern districts of the State. The staple measures about 7/8" with a ginning outturn of 25 per cent. As a result of selection two types have proved superior to the ordinary local cotton, one of which, known as Selection 69, occupies a large area (more than 10,000 acres) in the Herbaceum tract. The ginning percentage of this strain reaches 29. The lint of this selection is very much appreciated in the cotton market at Hubli.

The other varieties of *deshi* cottons found in other parts of the State are (1) Nadam cotton (*G. obtusifolium*) and black seeded Sannahatti (*G. herbaceum* var melanosperma).

As a result of hybridisation between *G. arboreum* and *G. herbaceum*, a strain of cotton has been evolved which has a staple of fully one inch with a ginning outturn of 29 per cent. This strain, it is hoped, will be given out for trial on a field scale next season.

Dharwar-American cotton (*G. hirsutum*) is also grown to a large extent in the State. This variety of cotton—grown especially round about Banavar in the Hassan District—has a reputation in the Bombay market. Improvement by selection within this variety as well as by trials of a new cross (Mysore-American), which also possesses valuable staple, is being carried out in places where Dharwar-American is grown.

APPENDIX V.

EXTRACTS FROM REVIEWS.

EACH Technological Bulletin is prefaced by a summary explaining the object of the investigation, the method of attack, and the results obtained. These summaries provide the basis for abstracts which have appeared in various scientific and technical journals, viz :—

(1) *Nature* (Research Items : December 1st, 1928—Yarn Strength and Yarn Extension ; March 16th, 1929—Early History of Cotton).

(2) *Journal of the Textile Institute* (Abstracts, June 1929, page A338 ; and September 1929, pages A471, A507 and A508).

(3) *Indian Textile Journal* (Vol. XXXIX, 1928-29, pages 38-9, 77, 187, 225 and 355).

(4) *International Cotton Bulletin* (Vol. VII, 1928-29, pages 162-5, 380, 651 and 652).

(5) *Empire Cotton Growing Review* (Vol. VI, 1929, pages 63, 64, 94, 95, 215, 258, 267, 341, 342, 374 and 376).

(6) *Commerce* (October 29, 1928, November 3, 1928, February 15, 1929).

(7) *Textile Manufacturer* (Vol. LIV, 1928, pages 267, 281, 317 and 426 ; Vol. LV, 1929, pages 39, 184, 220 and 283).

References to the work of the Laboratory have also appeared in *Capital*, the *Textile Recorder*, the *Textile Mercury*, the *Textile Weekly*, the *Textile World*, the *Melliand*, *Revue Textile*, *Coton and Culture Cotonniere*, *Textilberichte*.

The following extracts from reviews contain critical and appreciative references to the work carried out at the Laboratory :—

" *The Indian Textile Journal*," *October* 1928.

COTTON INDUSTRY OF INDIA.

Far-reaching Improvements Already Secured—Further Refinement Planned.

By H. Don Clement, A.I.J., Dip. Jrn.

In the course of the last few years the Central Cotton Committee of India has done much to improve the quality and quantity of Indian cottons. Special attention has been devoted to the most popular long and medium staple cottons grown under the supervision of the Agricultural Departments of the cotton-growing parts of India.

The Director of the Technological Laboratory, Matunga, (Mr. A. J. Turner, M.A., B.Sc.), is endeavouring now to prepare a series of standards by which to judge Indian cottons, particularly new cottons produced by cotton breeders, to determine the extent to which these standard cottons are affected by seasonal variations, and to assist the better marketing of the standard cottons by providing the cotton trade with detailed technological information.

Already, some valuable reports giving detailed information in regard to the effect of temperature and humidity on cotton spinning with particular reference to conditions in Bombay, the effect of using unbalanced drafts instead of balanced drafts in the spinning of standard Indian cottons, and the effect of different spindle speeds on the different cottons have been published. In a connected publication has been set out the areas covered by the different types of standard Indian cottons, the return they afford under different irrigated and other conditions, the ginning percentage and so on.

The reports referred to in the foregoing paragraph will be of immense value to cotton growers in all parts of India, to other cotton growers in other parts of the British Empire, and to millers of India, England, Germany and other parts of Europe, who import and use Indian cottons.

" *The Indian Textile Journal*," *July* 1929.

Technological Bulletins on Indian Cottons, Nos. 12, 13, 14 and 15. By James Turner, M.A., B.Sc. Published by the Indian Central Cotton Committee, Vulcan House, Nicol Road, Ballard Estate, Fort, Bombay.

Successful is the only fitting word that can best describe the work of the Technological Laboratory of the Indian Central Cotton Committee as more and more bulletins arrive, giving particulars of the areas and estimated outturn of improved cotton introduced by the Departments of Agriculture. A new and very interesting feature is the distribution of these new standard cottons, viz., Verum 262, Cambodia Co. 2, and Hagari 1. The first is a good stapled and soft cotton and is considered a good wilt resister. The second is inferior to Cambodia No. 1 but yields much more heavily and is a better resister of the stem-weevil and black arm. Hagari 1 gives a higher ginning percentage and a slightly higher yield than Hagari 25. The introduction of better species of cotton is growing apace in India, thanks to the researches of institutes like those at Indore and Bombay. Except mills which specialize in higher counts, all mills in India are self-supporting in the better quality cotton without having to import from abroad. Further tests on the effect of temperature on cotton spinning is dealt with in the Bulletin No. 14. The Bulletin No. 13 reports on samples of Punjab-American and Mollisoni (*desi*) cottons grown in different parts of Punjab, embodies the grader's report, the fibre-particulars, and a general discussion of all results obtained.

" Commerce," November 3, 1928.

THE TEXTILE TRADES.

* * * * * * * * * *

Probably the average person connected with the cotton industry does not realize the extent of the work of the Technological Research Laboratory of the Indian Central Cotton Committee. Most valuable data is being compiled every month in this laboratory at Matunga, under the able supervision of Mr. A. J. Turner, who has just completed his annual report, which will be published as a part of the full Report of the Indian Central Cotton Committee.....

* * * * * * * * * *

Readers ought to know more of the Technological Laboratory, which owes its inception to the Indian Cotton Committee, appointed in 1917 to investigate the position of the cotton industry in India. One of the most important recommendations of this Committee was that the Government of India should constitute a Central Cotton Committee with headquarters at Bombay. The work of the laboratory falls into two main divisions: first, the undertaking of spinning tests, and secondly, the measurement of the fibre properties of the cottons which are subjected to the spinning tests, with the object of ascertaining, if possible, the connection between such fibre properties and the spinning value of the cotton.

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" The Commercial " (Manchester Guardian)—Thursday, 13th December 1928, page 671.

YARN STRENGTH IN RELATION TO COTTON FIBRES.

For a number of years attempts have been made to correlate the strength of yarn with the strength of the component cotton fibres in particular and other properties of the cotton fibres in general. One would have wished that the author of this treatise had introduced the term " cotton " into the title, for it cannot be said that the treatment is applicable to all textile yarns. The subject has never been attacked thoroughly until recent years, and even now we are still in a state of partial bewilderment at the complexity of what would appear at first sight to be a simple problem. Those who have tried to solve the problem know that it bristles with experimental difficulties, and their respect for the judgment of the practical cotton spinner in choosing the raw material for his yarn grows with their interest in the scientific side of the subject.

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The perspicuity of the author's treatment of the factors affecting the relation of yarn strength to fibre strength (p. 14, *et seq*) is noteworthy, and is quite typical of Mr. Turner's writings on the general problems of cotton spinning. There is only one factor Mr. Turner's discussion of which the reviewer cannot logically follow, and that is the transmission of tension. It is difficult to visualise his suggestion that each individual fibre in loaded yarn is at maximum tension at its middle portion and at zero tension at each of its ends. Surely this conception is only valid if the tip of a fibre is slipping under load or if the extensibility is different at the ends from what it is at the remainder of the fibre. This section of the treatise is stimulating to read, and though the author remarks that it is not possible to assign any magnitudes to the various factors discussed, he clearly defines the factors to be considered in any quantitative treatment.

Though the reviewer has found it necessary to criticise many points in the treatise he feels how much he owes to Mr. Turner for having written such a clear exposition of a

very difficult subject. Mr. Turner has constructed for us a framework on which future work will build, though it may be necessary to redesign certain of its structural elements. The treatise should be read with interest by all interested in the practice and technology of cotton spinning.

"The Textile Manufacturer," 15th December 1928.

THE FOUNDATIONS OF COTTON YARN STRENGTH.

By A. J. Turner, M.A., B.Sc.

Bulletin No. 12 (Re. 1) issued by the Central Indian Cotton Committee is an interesting discussion of the relation between cotton yarn strength and fibre characters—namely, strength, length, diameters (or cross-section), rigidity, clinging power, extensibility, and uniformity. It is a subject of which much more might be known, and on which the pioneers, Monie and Bowman, were entirely misleading, as has also been pointed out recently by Dr. Lawrence Balls.

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From a consideration of the combined effects of all these factors, the conclusion is drawn that the yarn-strength must depend in some manner on the fibre-strength; and that while it is not at present possible to assign definite magnitudes to these various factors, it is yet easy to understand why only a small proportion of the strength of the fibres is apparently used in a yarn even when the breakage of the yarn is due at least as much to fibre-fracture as to fibre-slippage.

"The Textile Manufacturer," 15th January 1929.

REVIEW.

Annual Report of the Indian Central Cotton Committee. Bombay: G. Claridge & Co. Rs. 2.

The Indian Central Cotton Committee which came into being in 1921 as an advisory committee, was incorporated in 1923 to carry out research into the growing and marketing of cotton. Its operations cover advisory work to the Central Provincial Governments, the improvement of marketing, statistics, agricultural and technical research, and the fumigation of American cotton to exclude the boll-weevil. The extensive report covers all these questions. On the agricultural side the work is similar to that of the Empire Cotton Growing Corporation, and is thus both interesting and valuable to this country, as a large consumer of cotton, even though Indian cotton is not at present largely used here. The year's work of the technological laboratory, whose Director is Professor A. J. Turner, is described. This consists of tests of standard Indian cottons and samples of new types, and incidental research of the highest value. The considerable amount of work being done is meeting with a deserved success, and the report is an interesting story of the activities, and in addition includes valuable statistics and technical reports.

"The Textile Manufacturer," 15th June 1929.

COTTON SPINNING DRAWING PROCESS: THE EFFECT OF USING ONLY ONE OR TWO HEADS OF DRAWING.

The value of using three or four heads of drawing in cotton spinning is a matter of doubt for all classes of cotton, but three heads of drawing are usual. Nevertheless, it is generally recognized that two heads of drawing only may be necessary in many cases,

depending on the regularity of the sliver. The object of the drawing processes is to lay the fibres parallel, and to ensure regularity or uniformity in count or weight of sliver. To these might perhaps be added the functions of further blending of the cotton if that is at all necessary. From the point of view of regularity, the product of the third head of drawing is probably the most even in the whole process of cotton spinning, and it has been contended that the product after the second head of drawing is not inferior to the third in levelness. The further processes of drafting and twisting reduce the regularity, and indeed it may be reduced in the third or any other head of drawing if the most careful observation is not kept on the passage of the sliver and the conditions of the rollers, weighting, etc. As regards parallelization, a similar opinion has been expressed that the degree of parallelization is as good at the second as at the third, or, alternatively, that a high degree of parallelization is undesirable because it is likely to make a weak sliver, particularly in short-staple cotton, and lead to irregularity or breakage in being taken from the can at the slubbing frame.

The bearing on these points lends very great importance to the very voluminous data given in the report of tests made at the Technological Laboratory of the Indian Central Cotton Committee under the direction of A. James Turner, M.A., B.Sc. The summary and some of the detail results are given below.

* * * * * * * * * *

"The Textile Manufacturer," 15th July 1929.

THE EFFECT OF TEMPERATURE AND HUMIDITY IN COTTON SPINNING.

The reports of the experimental cotton spinning plant of the Matunga Technological Laboratory, Bombay, are always worthy of the closest study. Bulletin No. 19 deals with the effect of temperature, and particularly humidity, in cotton spinning, and cotton spinners should find the report of the greatest interest.

Though Lancashire conditions never go to the great extremes experienced in India and in other cotton-spinning countries, the subject is both directly and indirectly of the greatest importance to the industry in this country, and the behaviour should be known to every technical man. It must be confessed that very little is at present generally known about the effect of different relative humidities, atmospheric temperatures, and moisture content of the material on the working of cotton at each process. Humidity is a topic more discussed amongst Americans than in this country, which may be natural in view of the climatic conditions, but it might be suggested that the finer average counts spun, and the frequent necessity of spinning near the limit of the possible counts, make the subject of almost equal importance in Lancashire. In these circumstances the practical cotton man may find the details of the tests, including the spinning-master's reports of the behaviour at each stage, of greater interest even than the summary of the conclusions, because they may form a reliable basis of estimating the effect in carding, drawing, flyer frames, and spinning of certain conditions. The summary is given below, followed by some abstracts from the details.

* * * * * * * * * *

"Coton et Culture Cotonniere," Septembre 1928.

James Turner.—Technological reports on Standard Indian Cottons, 1928. (Rapports technologiques sur les cotons indiens, année 1928.) Indian Central Cotton Committee. Bull. No. 16, Techn. Séries No. 11, p. 118, fig. 20. Bombay, Juin 1928.

Dans l'étude technologique des cotons, l'Auteur pense, avec juste raison, qu'il n'est suffisant de se limiter aux mesures des diverses propriétés de la fibre prise isolément, mais qu'il faut surtout l'étudier a l'état de "filé," puisque normalement le coton doit

etre filé pour etre tissé. C'est pourquoi, dans cette étude, la partie consacrée aux essais des " filés " est importante, diverses méthodes de mesure ayant été créés ou perfectionnées par l'Auteur et ses collaborateurs.

Un exposé de ces méthodes est fait en détail, et les résultats obtenus ont permis d'établir quatre groupes ou classes parmi l'ensemble des principaux cotons indiens.

Indépendamment de ceci, des déterminations ont été faites en vue d'étudier les variations saisonniéres de la longueur moyenne des fibres, et les relations entre les caractéres des fibres et leur valeur textile.

Un ensemble de mesures des diverses propriétés des fibres (longueur, force, résistance, épaisseur, circonvolutions) complète cet important travail.

* * * * * * * * * *

APPENDIX VI.

BALANCE SHEET AS ON 31ST MARCH 1929.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		59,55,086 5 9	I. Administration		8,03,364 6 5
INTEREST ACCOUNT.			(*b*) Improvement of Cotton Marketing		62,567 2 9
Amount received on investments and Fixed Deposits.	5,77,935 7 6		II. *Technological Research*—		
Refunds of income-tax deducted on interest ..	9,277 11 0		(*a*) Technological Laboratory—Capital Expenditure :		
	5,87,213 2 6		1. Lands and Buildings	3,55,797 9 11	
Less :—			2. Machinery	78,385 0 3	
Interest paid in advance at the time of purchasing Government Paper—since recovered—and Bank's commission on interest collection ..	25,343 7 11		3. Freight	7,502 2 8	
Income-tax deducted on interest on Government Paper	9,698 0 0		4. Apparatus and Equipment	41,558 3 7	
Interest credited to Provident Fund account ..	4,886 6 2		5. Machinery Workshop	5,789 8 3	
Bank's withdrawal charges for Tax Free loan sold.	1,507 8 0		(*b*) Technological Laboratory—Working Expenses	6,04,002 11 6	
		5,45,777 12 5	(*c*) Provincial	3,588 9 0	10,96,623 13 2
Profit on conversion 6 per cent. 1926 Bonds to 5 per cent. 1935 Taxable		5,000 0 0	III. Research Studentships		1,55,143 9 3
Miscellaneous receipts		7,176 10 1	*Agricultural Research Grants*—		
		65,13,040 12 3	IV. Bombay	3,46,706 6 6	
Suspense Receipts		11,927 6 11	V. Madras Herbaceum	60,485 8 0	
(Amount payable to the Trustees to the Indian Central Cotton Committee Provident Fund for Committee's contributions and interest as on 31-3-29.)			,, Pempheres and Physiological ..	1,087 5 0	
			VI. Punjab Botanical	1,97,840 4 2	
			,, Entomological	49,034 0 0	
			VII. Central Provinces	1,48,386 11 7	
			VIII. United Provinces	1,08,317 1 0	
			IX. Institute of Plant Industry, Indore	7,14,676 12 0	
			X. Sind	37,869 2 3	
			XI. Burma	2,906 15 5	16,67,310 1 11
			Suspense Account		2,600 4 7
			Investments and cash balances		27,37,358 13 1
Total Rs. ..		65,24,968 3 2	Total Rs. ..		65,24,968 3 2

PROVIDENT FUND ACCOUNT AS ON 31ST MARCH 1929.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.
Subscribers' contributions ..	36,787 6 11		Expenditure for stationery, transfer fees, cost of stamps and registration charges for the P/A given to the Imperial Bank by the Trustees ..	108 5 0
Committee's contributions ..	36,004 6 8		Accrued interest paid to subscribers' account ..	737 10 0
Recoveries against advances ..	2,421 4 0		Cost of 3½% G. P. Notes of Rs. 73,200	51,730 7 1
	75,213 1 7		Cost of 6% 1930 Tax Free Loan of Rs. 4,000 ..	4,061 4 0
Less:—				
Refunds to subscribers resigned	2,655 0 4		Balance in Current Account	1,185 0 3
Advances	2,805 0 0			
	5,460 0 4	69,753 1 3	Due from the Indian Central Cotton Committee on account of Committee's contributions and interest as on 31st March 1929	11,927 0 11
Grand Total Rs. ..		69,753 1 3	Grand Total Rs. ..	69,753 1 3

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH 1929.

Receipts.	Rs.	a.	p.
Opening Balance	26,16,752	8	9
Receipts under Section 12 of the Indian Cotton Cess Act, 1923	6,44,180	3	10
*Other Receipts	14,502	15	2
Interest on Investments	1,34,409	10	1
Total Rs.	34,09,845	5	10

Expenditure.	Rs.	a.	p.	Rs.	a.	p.
I. Administration of the Committee (including Improvement of Cotton Marketing)	1,46,044	15	1			
Less: Refunds from Directors of Agriculture, Bombay and Punjab on account of unexpended balances of Cotton Finance Inquiry Grants made during the previous years, and from East India Cotton Association for type bales supplied to them	2,186	5	4			
				1,43,858	9	9
II. Agricultural Research Grants-in-aid				3,85,924	8	5
III. Technological Research				1,40,103	2	0
IV. Closing Balance—						
(Government Paper at cost).						
3½% Government P. Notes of the Face value of Rs. 11,56,300	8,17,180	12	11			
5% Taxable Loan 1935 ,, ,, ,, ,, 7,00,000	6,63,556	4	0			
5% ,, ,, 1929-47 ,, ,, ,, ,, 7,88,000	7,65,220	12	10			
4½% Indian Sterling Stock ,, ,, ,, £ 24,000	2,89,384	10	10			
6% Ten Year Bonds 1930 ,, ,, ,, Rs. 15,000	15,225	0	0			
4½% Government of India Loan 1955-60, Face Value 26,600	25,004	0	0			
†8% Bombay Municipal Debentures, Face Value 50,000	36,500	0	0			
Fixed and Call deposits (with Approved Banks)	83,000	0	0			
Imperial Bank of India, Ltd., Current Account	19,787	4	6			
Imprest—Committee's Account (Certified by the Secretary).	1,500	0	0			
Imprest—Technological Laboratory (Certified by the D. T. L.).	500	0	0			
Imprest—Cotton Research Botanist, Punjab). (Certified by the Cotton Research Botanist, Punjab).	560	0	0			
Suspense (recoverable)	2,600	4	7			
‡Total Closing Balance				27,39,959	1	8
Total Rs.				34,09,845	5	10

* Includes Rs. 11,927-6-11 on account of Committee's Contribution and Interest on the Provident Fund Account as on 30th March 1929.
† Deposited with Imperial Bank of India for securing against any overdraft that may be required by the Committee.
‡ This amount includes Rs. 11,927-6-11 on account of Provident Fund Account.

We have examined the above Statement of Receipts and Expenditure of the Indian Central Cotton Committee with the Books, Vouchers and certified returns of the Committee, have obtained all the information and explanations we have required and certify that to the best of our information and explanations received, the above Statement is a correct abstract of the figures appearing in the books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, *10th May* 1929.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors.

PROVIDENT FUND ACCOUNT AS ON 31ST MARCH 1929.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.
To Opening Balance as on 1st April 1929		47,049 8 2	By Expenditure for stationery, transfer fees, cost of stamps and registration charges for the Power-of-Attorney granted by the Trustees to the Imperial Bank of India and commission on interest collected by the Bank	108 5 0
,, Subscribers' contributions	10,165 7 0			
Less—Refund to subscribers	14 9 0			
	*10,150 14 0		,, Investment in 3½% G. P. Notes of the face value of Rs. 73,200 ..	51,730 7 1
Add—Recoveries against advances	671 4 0			
	10,822 2 0		,, Investment in 6 per cent. 1930 Tax Free Bonds of the face value of Rs. 4,000	4,061 4 0
Less—Advances to subscribers	805 0 0			
		10,017 2 0		
			,, Balance in Current Account	1,188 0 3
Interest received from subscribers	5 3 6			
Interest received on investments	120 0 0		,, Amount due from the Indian Central Cotton Committee for the Committee's contributions as on 31st March 1929 and interest on subscribers' and Committee's contributions..	11,927 6 11
Interest receivable from the Indian Central Cotton Committee on subscribers' contributions	919 5 11			
Do. do. on Committee's contributions ..	857 3 0			
	1,901 12 5			
Less:—Advance interest paid for the Government Paper purchased (since recovered)	103 13 4			
		1,797 15 1		
Committee's contributions due from the Indian Central Cotton Committee at 100 per cent.		*10,150 14 0		
Grand Total Rs. ..		69,015 7 3	Grand Total Rs. ..	69,015 7 3

Examined and found correct.

(Sd.) S. B. BILLIMORIA & Co.,

28th May 1929.

Auditors.

APPENDIX VII.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH SCHEMES UP TO 31ST MARCH 1929.

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure up to 31st March 1929.	Expenditure from Capital grant on (a) Lands and buildings.	Expenditure from Capital grant on (b) Machinery and apparatus and other movable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
II. *Technological Research*—	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(1) Technological Laboratory.									
(a) Capital Expenditure..	5,04,799 3 8	Permanent.	1923.	....	3,55,797 9 11	1,33,234 14 9	....	....	¶Cotton Breeding Scheme closed down in 1929.
(b) Working Expenditure	6,04,002 11 6		Jan. 1924. April 1928	10,96,623 13 2	....	....	19,248 11 6	5,84,754 0 0	
(2) Provincial ,, ..	3,588 9 0				....	....	....	3,588 9 0	
AGRICULTURAL RESEARCH GRANTS.									
IV. *Bombay Schemes*—									*This amount includes Rs. 1,400 transferred to capital grant.
(1) Surat Physiological ..	2,91,445 0 0	10 years.		1,34,010 10 1	....	....	16,041 8 6	1,17,969 1 7	
(2) Surat Boll-worm ..	1,13,670 0 0	7 years.	September 1923.	84,689 13 0	....	....	5,727 13 1	78,961 15 11	
(3) Dharwar Wilt and Cotton Breeding¶..	2,63,545 0 0	10 years.		1,16,360 10 5	....	....	13,507 3 3	1,02,853 7 2	† This amount excludes Rs. 1,400 transferred as above.
(4) Khandesh Cotton Breeding	25,000 0 0	5 years.	October 1926.	11,645 5 0	....	....	....	11,645 5 0	
V. *Madras Schemes.*—									‡The balance of this amounting to Rs. 3,100-13-5 lapsed owing to revision of scheme.
(1) Herbaceum	72,985 0 0	7 years.	December 1923.	60,485 8 0	....	....	3,232 1 9	57,253 6 3	
(2) Pempheres and Physiological	2,75,000 0 0	5 years.	Not started.	1,087 5 0	....	....	....	1,087 5 0	
VI. *Punjab Schemes.*—									
(1) Botanical.									
(a) Capital Expenditure..	* 30,700 0 0	5 years.	August 1925	1,97,840 4 2	22,210 0 0	8,490 0 0	....	....	§Figures for 1928-29 taken from budget estimates and subject to revision on receipt of annual returns.
(b) Working Expenditure.	†2,23,600 0 0	Do.					$7,572 12 5	$1,59,567 7 9	
(2) Entomological.									
(a) Capital Expenditure..	6,000 0 0	5years	May 1926.	49,034 0 0	....	5,826 3 10	....	....	
(b) Working Expenditure.	85,000 0 0				....	....	$2,208 1 6	$40,999 10 8	
VII. *Central Provinces*—	‡ 61,000 0 0	2½ years.	October 1923	1,48,386 11 7	....	....	....	1,38,027 6 3	
	3,22,165 0 0	8 years.	April 1926		....	....	10,359 5 4		
VIII. *United Provinces.*—									
Pink Bollworm Scheme.—									§This includes Rs. 50,202-12-10 transferred from recurring grant.
(a) Capital Expenditure..	54,000 0 0	....	....		....	48,011 9 3	....	....	
(b) Working Expenditure.	56,000 0 0	5 years.	April 1925	1,08,317 1 0	....	....	2,714 6 3		
(c) Recurring grant for staff	25,200 0 0	Do.	Sept. 1926		....	....	....	57,591 1 6	
IX. *Institute of Plant Industry, Indore.*—									||This excludes Rs. 50,202—12—10 transferred to capital grant.
(a) Capital Expenditure..	§2,83,536 11 9	Perma	October 1924.	7,14,876 12 0	2,12,552 11 5	70,984 0 4	....	....	
(b) Working Expenditure.	‖4,31,140 6 3	nent.			....	....	31,857 4 4	3,99,282 11 11	
X. *Sind*	1,00,000 0 0	5 years.	July 1927	37,869 2 3	....	....	5,522 2 4	32,346 15 11	
XI. *Burma*—Capital	3,000 0 0			2,906 15 5	....	2,906 15 5	....	....	
Total ..				27,63,933 15 1	5,90,560 5 4	2,69,453 11 7	1,17,991 6 3	17,85,928 7 11	

Summary.

	Rs. a. p.
Capital grants (a) Lands and buildings	5,90,560 5 4
(b) Machinery, apparatus and other movable property	2,69,453 11 7
Apparatus and equipments of a permanent or semi-permanent nature purchased from annual grants	1,17,991 6 3
Total Rs.. .	9,78,005 7 2

APPENDIX VIII.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929.

TECHNOLOGICAL RESEARCH LABORATORY.

1.	Director, Technological Research Laboratory, Bombay.	Dr. A. James Turner, M.A. (Cantab.), 1st Class Parts I and II Natural Sciences Tripos, D.Sc. (London).	Late Professor of Textile Technology, University of Manchester and College of Technology, Manchester.
2.	Spinning Master, Technological Research Laboratory, Bombay.	Mr. R. P. Richardson, A.T.I. London City and Guilds Full Honours Certificate.	.....
3.	Senior Research Assistant (Chemist), Technological Laboratory, Matunga, Bombay.	Mr. D. L. Sen, M.Sc. Tech. (Manch.), M.Sc., A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
4.	Assistant Technologist	Mr. D. F. Kapadia, B.Sc., Tech. (Vict.), B.A. (Bom.).	Research Scholar, Technological Research Laboratory (Textile Physics).
5.	Junior Research Assistant (Microscopist), Technological Laboratory, Matunga, Bombay.	Mr. H. N. Dutt, B.Sc., M.B.	Recently Demonstrator in Botany, Gujerat College, Ahmedabad.
6.	Junior Research Assistant (Microscopist), Technological Laboratory, Matunga, Bombay.	Mr. Amar Nath Gulati, M.Sc..	Imperial Institute of Veterinary Research, Muktesar, U.P.
7.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (1st Class First), Calcutta University.	Research Scholar, Technological Research Laboratory (Textile Physics).
8.	Junior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc.	Do. do.
9.	Statistician	Mr. V. Venkataraman, M.A. (Madras), 1st Class Honours in Mathematics.	Recently Statistical Assistant, Labour Office, Bombay.
10.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	.....
11.	Junior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.) ..	.....

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929—*contd.*

12.	Junior Tester	Mr. K. G. Deo, passed Examination in Arts, Bombay.	.....
13.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	.....
14.	Junior Tester	Mr. K. S. Marar, B.A., LL.B.	.....
15.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	.....
16.	Junior Tester	Mr. G. D. Bhide, B.Sc...	.....
17.	Junior Tester	Mr. K. V. N. Nayar	.....
18.	Junior Tester	Mr. V. N. Modak, B.Sc.	.....
19.	Junior Tester	Mr. L. V. Sundararaman, B.A.	.....
20.	Junior Tester	Mr. P. S. Sambamurthi	.....
21.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	.....
22.	Spinning Assistant	Mr. N. Iyengar	.....
		INSTITUTE OF PLANT INDUSTRY, INDORE.	
23.	Director, Institute of Plant Industry, Indore.	Mr. A. Howard, C.I.E., M.A. (Cantab) ..	Recently Imperial Economic Botanist.
24.	Physiological Botanist	Mrs. G. L. C. Howard, M.A. (Dublin), M.A. (Cantab.).	Recently 2nd Imperial Economic Botanist.
25.	Assistant in charge of Extension Work..	Mr. K. R. Joshi, L.Ag. (Nagpur)	Lent by Indore State Agricultural Department. 15 years in Indore State Agricultural Department.
26.	Personal Assistant to the Director ..	Mr. Misri Lal Saxena, L.Ag. (Cawnpore) ..	6 years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*concld.*

27.	Assistant in charge of Seeds and Experimental Farm.	Mr. G. C. Tambe, B.Ag. (Bombay)	.....
28.	Botanical Assistant	Mr. T. C. N. Singh, M.Sc. (Lucknow) ..	Recently Lecturer in Botany, Lucknow University.
29.	Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay) ..	Research Student, Indian Central Cotton Committee.
30.	Junior Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	.....
31.	Junior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad) ..	.....
32.	Junior Assistant	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
33.	Junior Assistant	Mr. G. G. Phadke, L.Ag. (Nagpur)	.....

BOMBAY RESEARCH SCHEMES.

(1) *Physiology.*

34.	Botanist in charge of Cotton Research Scheme No. 1—Physiology of the Cotton Plant in Gujerat.	Mr. K. V. Joshi, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
35.	Senior Research Assistant	Mr. S. V. Godbole, M.Sc., B.Ag.	.....
36.	Junior Research Assistant	Mr. N. M. Nitimargi, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
37.	Junior Research Assistant to the Cotton Physiologist.	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
38.	Junior Assistant	Mr. R. B. Gode, M.Sc.	.....

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1920—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(ii) *Mycological.*

39.	Special Cotton Mycologist in charge of the Cotton Wilt Disease and Cotton Breeding Scheme, Dharwar.	Mr. G. S. Kulkarni, M.Ag. (Bombay) ..	Assistant Mycologist and Assistant Professor of Mycology, Poona College of Agriculture. On deputation from Bombay Department of Agriculture.
40.	Junior Assistant	Mr. T. R. Khadilkar, B.Ag. (Bombay) (with advanced Botany), III Grade Drawing, School of Arts, Bombay.	On deputation from Bombay Department of Agriculture.
41.	Junior Assistant	Mr. J. D. Ranadive, B.Ag., B.Sc.	Research Student, Indian Central Cotton Committee.

(iii) *Entomological.*

42.	Cotton Entomologist, Spotted Boll-worm Investigation.	Mr. Ramrao S. Kasargode, L.Ag. (Bombay).	Assistant Professor of Entomology, Agricultural College, Poona—on deputation.
43.	Assistant (Acting Cotton Entomologist).	Mr. B. P. Deshpande, B.Ag. (Bombay), 1st Class.	On deputation from Bombay Department of Agriculture.
44.	Assistant	Mr. N. T. Nadkarni, B.Ag. (Bombay) ..	....
45.	Assistant	Mr. B. J. Thakar, B.Ag. (Bombay)	On deputation from the Bombay Department of Agriculture.
46.	Assistant	Mr. M. S. Patel, B.Ag.	....

(iv) *Khandesh Cotton Breeding Scheme.*

47.	Graduate Assistant	Mr. N. R. Yardi, B.Ag. (Bombay)	....
48.	Graduate Assistant	Mr. M. S. Pandya, B.Ag.	On deputation from the Bombay Department of Agriculture.
49.	Fieldman	Mr. P. A. Rao	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929—*contd.*

BOMBAY RESEARCH SCHEMES—*concld.*

(v) *Sind Research Scheme.*

50.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc., 1st Class	....
51.	Senior Assistant	Dr. R. D. Rege, B.A., M.Sc. (Bom.), Ph.D. (Lond.), A.I.I.Sc.	....
52.	Junior Assistant	Mr. Rustom M. Ranji, Dip. in Ag. (Bombay).	....
53.	Junior Assistant	Mr. R. G. Deshpande, B.Ag.	On deputation from Bombay Department of Agriculture.

CENTRAL PROVINCES RESEARCH SCHEME.

(i) *Botanical.*

54.	Economic Botanist for Cotton (on leave)	Dr. W. Youngman, B.Sc. (London), Ph.D. ..	Holds permanent post in Government service.
55.	Second Economic Botanist (Acting) ..	Mr. D. N. Mehta, B.A. (Oxon.), F.L.S. ..	Temporary.
56.	1st Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. S. C. Roy, L.Ag. and Post Graduate, Pusa.	On deputation from Central Provinces Agricultural Department.
57.	2nd Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. S. S. Pande, M.Sc.	Research Student, Indian Central Cotton Committee.
58.	3rd Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Agricultural Department.
59.	4th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.
60.	5th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do. do.
61.	6th Assistant to Economic Botanist for Cotton, Central Provinces.	Mr. V. N. Paranjpe, B.Sc. ..	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929—*contd.*

MADRAS HERBACEUM SCHEME.

62.	Senior Assistant	R. Balasubramaniam, B.A., B.Sc. (Ag.) ..	On deputation from Madras Department of Agriculture.
63.	Assistant	Mr. G. Seshadri Ayyangar, M.A.	.....
64.	Assistant	Mr. V. Ramaswami Mudaliar, B.A.	....
65.	Sub-Assistant	Mr. D. Devasirvatham, Government Tech. Exam. in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

PUNJAB RESEARCH SCHEME.

(i) *Botanical.*

66.	Cotton Research Botanist	Mr. Trevor Trought, M.A. (Cantab.), 1st Class Nat. Sci-Tripos Agric. Diploma, Cambridge University Development Board Scholar.	Recently Senior Botanist, Ministry of Agriculture, Egypt, for 6 years attached Cotton Research Board.
67.	Assistant to Cotton Research Botanist .	Chaudhri Mohd. Akbar, L.Ag. (3 years) ..	On deputation from Punjab Department of Agriculture.
68.	Technical Assistant	Bh. Sarup Singh, L.Ag. (4 years)	Do. do.
69.	Technical Assistant	Mr. Akbar Ali, B.Sc. (Post Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from the Punjab Department of Agriculture.
70.	Technical Assistant	Mr. Rameshchandar, B.Sc. (Ag.)	On deputation from the Punjab Department of Agriculture.
71.	Technical Assistant	Ch. Mohd. Rashid, L.C. Course	Do. do.

(ii) *Entomological.*

72.	Assistant Cotton Entomologist in charge, Pink Boll-worm Research Scheme.	Mr. Sohan Singh Bindra, M.Sc.	Research Student, Indian Central Cotton Committee.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1929—*concld.*

PUNJAB RESEARCH SCHEME—*concld.*

(ii) *Entomological*—concld.

73.	Field Assistant	Mr. Ladha Ram, B.Sc.	....	
74.	Field Assistant	Mr. Ganda Ram, B.Sc.	....	
75.	Field Assistant	Mr. Dev Raj, B.Sc. (Hons. School)	....	
76.	Statistical Assistant	Mr. Rishi Kesh, B.A. (Punjab)	....	

UNITED PROVINCES RESEARCH SCHEME.

77.	Research Assistant, Pink Boll-worm Investigations.	Mr. H. D. Nangpal, M.Sc.	Research Student, Indian Central Cotton Committee.	
78.	Junior Assistant, Pink Boll-worm Investigations.	Mr. V. R. Singh, L.Ag. (Cawnpore)	Do.	do.

TECHNOLOGICAL ASSISTANTS PAID DIRECT BY INDIAN CENTRAL COTTON COMMITTEE.

79.	Under Cotton Specialist, Coimbatore ..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.
80.	Under Cotton Breeder, Dharwar ..	Mr. H. R. Nayak, Inter. Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.
81.	Under Cotton Research Botanist, Lyallpur.	Mr. K. R. Sen, M.Sc. (Dacca)	Research Student, Indian Central Cotton Committee.

APPENDIX IX.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	Assistant Entomologist, Lyallpur, Pink Bollworm Research Scheme.	Indian Central Cotton Committee.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Assistant to Cotton Research Botanist, Punjab Agricultural Department. Punjab Botanical Research Scheme.	....
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Indian Central Cotton Committee.
6 ,,	Jiwan Singh, M.Sc. (Punjab).	Nagpur	Cotton Mycology ..	Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme. Employed up to 31-3-29.	Services terminated. Scheme closed down from 1-4-29.
,,	Ilabonto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	No record	Held a Senior Research Studentship under Dr. M. A Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

LIST OF RESEARCH STUDENTS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Cotton Breeder, Sind, Bombay Agricultural Service.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924.	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	No record	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	Assistant Entomologist, Pink Boll-worm Investigation, United Provinces.	Indian Central Cotton Committee.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University)	Surat	Cotton Physiology .	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925.	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	Research Assistant under the Entomologist to Government, United Provinces, Cawnpore.	Indian Central Cotton Committee.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding).	Technical Assistant to Cotton Research Botanist, Punjab. Punjab Agricultural Department.	Indian Central Cotton Committee.

4

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyllapur	Cotton Entomology.	Entomological Assistant, Punjab Agricultural Department up to 1-4-29.	Now Senior Research Student to study "white fly" problem at Khanewal.
8 ,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Dharwar, up to 31-7-29.	Resigned to proceed to England for further studies.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Junior Assistant under Special Cotton Mycologist, Dharwar Wilt Scheme.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
,,	L. N. Rao, M.Sc. (Calcutta) .	Do. ..	Cotton Microscopy.	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926.	D. F. Kapadia, B.A., B.Sc. (Tech. Manchester).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Junior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology .	Assistant, Surat Physiological Scheme.	Indian Central Cotton Committee.
7 ,,	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., M.Sc. (Bombay).	Coimbatore.. ..	Cotton Bio-chemistry.	Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	H.A. Idnani, B.Ag. (Bombay)	Institute of Plant Industry, Indore.	Cotton Botany ..	Assistant at the Sakrand Experimental Station, Sind. Bombay Agricultural Department.	....
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Junior Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
1927.	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Coimbatore.	Indian Central Cotton Committee.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	Government Scholar for study abroad.	....
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Cotton Entomology.	Government Scholar for study abroad.	....
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology .	No record	....
,,	Sant Singh Varma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt investigation.	Temporary Microscopist, Lyallpur, Punjab Botanical Scheme.	Indian Central Cotton Committee.
,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain. Gwalior Department of Agriculture.	....
,.	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	No record	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....

LIST OF RESEARCH STUDENTS—*concld.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1928.	K. Dharmarajulu, B.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Research Student	Under training.
,,	Piare Mohan, B.Sc. (Honours School), Punjab.	Cawnpore	Cotton Entomology	Do.	Under training.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy .	Do.	Under training.
,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (Univ. of Edin.)	Institute of Plant Industry, Indore.	Cotton Agronomy .	Madras Agricultural Service. Personal Assistant to Director of Agriculture.	....
,,	C. Nanjundayya M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Research Student.. ..	Under training.
1929.	Shrinagabhushana, B.Sc. ..	Technological Laboratory, Matunga.	-Technology ..	Research Student	Under training.
,,	Bhai Pratap Singh Bhullar .	Lyallpur	Cotton Marketing and Economics.	Do.	Under training.
,,	Bhai Ajaib Singh Gulzar ..	Do.	Do. ..	Do.	Under training.

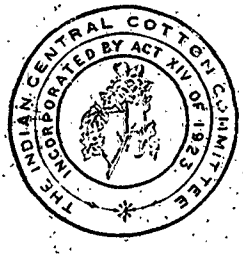
5

3

42 Total.

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants.

22 DEC. 1930



ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST 1930.

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ANNUAL REPORT

OF THE

Indian Central Cotton Committee, Bombay,

FOR THE

Year ending 31st August

1930.

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1930.

CHAPTER I.

THE Central Cotton Committee was constituted by Resolution No. 404-22, dated 31st March 1921, of the Government of India in the Department of Revenue and Agriculture. Originally it was an advisory body, but with its incorporation on the passing of the Cotton Cess Act in 1923, it was provided with funds "for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee therefore fulfils two main functions. In the first place it advises the Government of India and Local Governments on subjects pertaining to cotton growing and marketing by dealing with references made to it and also by bringing to the notice of Government matters which, it considers, require attention. Secondly, it supplies funds for research into cotton problems designed for the benefit of India as a whole or for large tracts of country in which cotton is an important crop. This latter part of the Committee's work is now assuming great importance and has reached the stage of showing practical results, as will be seen at a later stage of this Report.

2. Another great advantage of a body constituted like the Indian Central Cotton Committee was well brought out in the address given by His Excellency the Right Hon'ble Sir Frederick Hugh Sykes, P.C., G.C.I.E., G.B.E., K.C.B., C.M.G., Governor of the Bombay Presidency, at the twenty-first meeting of the Committee held on the 30th June 1930, in which he said :—

> "In these days of strenuous competition it is becoming increasingly important to organize every activity in both the agricultural and the industrial spheres. I fully sympathise with the principle underlying the policy of the Government of India which inspired it to create this Committee. That principle was to bring together under one roof all the main interests associated with cotton, embracing the grower, the ginner and dealer, the millowner, the exporter and the agricultural expert. Your personnel is, in fact, all-embracing, and there is no problem concerning cotton which cannot be discussed authoritatively by this Committee. It seems to me that the personal contact which is thus secured must be of the highest value in facilitating intercourse and consultation between sectional interests."

PERSONNEL.

3. The composition of the Committee on August 31st, 1930, was as follows. Under the Indian Cotton Cess Rules members hold office for three years, and one-third retire each year in rotation.

(1) PRESIDENT—Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) Mr. B. C. Burt, C.I.E., M.B.E., I.A.S., Expert Adviser to the Imperial Council of Agricultural Research in agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. D. G. Munro, I.A.S., Deputy Director of Agriculture.
Bombay	Mr. T. F. Main, O.B.E., I.A.S., Director of Agriculture.
United Provinces ..	Mr. P. B. Richards, I.A.S., Entomologist to Government.
Punjab	Mr. D. Milne, C.I.E., I.A.S., Director of Agriculture.
Central Provinces ..	Mr. R. G. Allan, I.A.S., Offg. Director of Agriculture.
Burma	Mr. T. D. Stock, I.A.S., Offg. Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Major W. Ellis Jones.
The Bombay Mill-owners' Association ..	Mr. S. D. Saklatvala (*Vice-President*).
The Bombay Chamber of Commerce ..	Sir Joseph A. Kay, Kt.
The Indian Merchants' Chamber	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E.
The Karachi Chamber of Commerce ..	Mr. G. C. R. Coleridge.
The Ahmedabad Mill-owners' Association .	Seth Kasturbhai Lalbhai.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce	Mr. H. A. Wilkinson.
The Empire Cotton Growing Corporation	Mr. W. Roberts.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Sir Sorabji B. Mehta, Kt., C.I.E. Rao Bahadur K. J. Deshmukh.
Madras	Mr. H. B. Moore.
Punjab	Rai Bahadur Lala Sewak Ram.
Bengal	Mr. Girija Prasanna Chakravarty.

(7) CO-OPERATIVE BANKING REPRESENTATIVE—Sardar Sampuran Singh.

(8) REPRESENTATIVES OF COTTON GROWING INDUSTRY.

Madras	M.R.Ry. R. Appaswamy Naidu Garu. M.R.Ry. K. Sarabha Reddi Garu.
Bombay	Rao Bahadur Bhimbhai Ranchodji Naik. Rao Saheb Chenbasappa Shidramappa Shirahatti.
United Provinces ..	Rai Bahadur Amba Prasad. Rai Saheb Bikram Sinha.
Punjab	Major D. Vanrenen. Sardar Ujjal Singh.
Central Provinces and Berar.	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General and Secretary to Government, Department of Commerce and Industries.
Baroda State	Dr. V. N. Likhite, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Administrative Officer, Department of Agriculture.
Rajputana and Central India States	Mr. A. Howard, C.I.E., Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist to Government, Central Provinces.
2. Dr. W. Burns, I.A.S., Principal, Agricultural College, Poona.
3. Dr. L. C. Coleman, Director of Agriculture, Mysore State.
4. Mr. G. R. Hilson, I.A.S., Director of Agriculture, Madras.

5. Mr. C. R. Palairet, Member for Commerce and Industry, Holkar Durbar, Representative of the Indore State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer, Sind.
7. Lala Niranjan Prasad, Representative of the Karachi Indian Merchants' Association, Karachi.
8. B. Ram Prasad, Assistant Economic Botanist to Government, United Provinces.

Secretary—Mr. J. H. Ritchie, I.A.S.

Deputy Secretary—Vacant.

Director, Technological Laboratory—Dr. A. James Turner, M.A., D.Sc.

4. On the formation of the Imperial Council of Agricultural Research and the abolition of the post of the Agricultural Adviser to the Government of India, Dewan Bahadur Sir T. Vijayaraghavachariar, the Vice-Chairman of the Council, became *ex-officio* President of the Committee and attended the twentieth meeting at Indore in that capacity.

Mr. B. C. Burt, C.I.E., M.B.E., Agricultural Expert on the Imperial Council of Agricultural Research and late Secretary of the Committee, has also been nominated an *ex-officio* member of the Committee.

Mr. S. D. Saklatvala, representative of the Bombay Millowners' Association since 1926, was re-elected *Vice-President* for the year 1930-31.

SUB-COMMITTEES.

5. The following members were appointed to form the *Standing Finance Sub-Committee* required by the Rules under the Indian Cotton Cess Act :—

Mr. S. D. Saklatvala (*Vice-President*), Sir Purshotamdas Thakurdas, Seth Kasturbhai Lalbhai, Rao Bahadur Bhimbhai Ranchodji Naik, Messrs. W. Ellis Jones, G. C. R. Coleridge, J. Vonesch and T. G. Ralli.

Sir Joseph Kay took Mr. Ralli's place from the month of February 1930.

At the twenty-first meeting, the Committee passed a resolution requesting the Government of India to amend the Rules under the Act so as to permit of the President becoming an *ex-officio* member, thus increasing the number to nine. This request has been granted by the Government of India.

Fourteen meetings were held during the year.

6. The *Local Sub-Committee* was composed of the following members :—

Mr. S. D. Saklatvala (*Vice-President*), Sir Purshotamdas Thakurdas, Rao Bahadur Bhimbhai Ranchodji Naik, Seth Kasturbhai Lalbhai, Messrs. W. Ellis Jones, T. G. Ralli, G. C. R. Coleridge, J. Vonesch, C. V. Sane and M. P. Kolhe.

Mr. Kolhe ceased to be a member from 1st April 1930. Sir Joseph Kay took Mr. Ralli's place from the month of February and Dr. Likhite replaced Mr. Sane from June 1930.

This Sub-Committee consists of all members living in or near Bombay and any other members who may be in Bombay at the time of a meeting. The Sub-Committee deals with all subjects of a general nature between the half-yearly meetings of the full Committee.

This Sub-Committee met seven times during the year.

7. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee was appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. The membership for 1930 was as follows :—

Mr. S. D. Saklatvala (*Vice-President*), Sir Purshotamdas Thakurdas, Sir Sorabji B. Mehta, Rao Saheb V. Krishna Menon, Messrs. W. Ellis Jones, G. C. R. Coleridge, T. G. Ralli, J. Vonesch, H. A. Wilkinson, W. Roberts and Robert Lee.

Sir Joseph Kay took Mr. Ralli's place from the month of February 1930 ; Mr. H. B. Moore replaced Mr. Lee from April 1930 and Sardar Sampuran Singh took Rao Saheb V. Krishna Menon's place from July 1930.

Two meetings were held during the year.

8. *Sub-Committee on Malpractices.*—This Sub-Committee was formed last year for the purpose of dealing with all questions relating to abuses and malpractices. It met four times during the year. The membership of this Sub-Committee was as follows :—

Mr. S. D. Saklatvala (*Vice-President*), Sir Purshotamdas Thakurdas, Rao Bahadur Bhimbhai Ranchodji Naik, Messrs. W. Ellis Jones, G. C. R. Coleridge, T. G. Ralli and T. F. Main.

Sir Joseph Kay took Mr. Ralli's place on this Sub-Committee from the month of February 1930.

At the second meeting of this Sub-Committee held at Indore on November 10th, 1929, the Punjab members on the Committee and also a representative each of the Punjab Co-operative Department, the Punjab Factory-owners and the Zemindars were present by invitation to discuss the question of the mixing of Punjab-American cotton. At the third and fourth meetings, when the question of pools of cotton ginning and pressing factories was discussed, a representative of the Khamgaon Factory Owners' Association and three additional co-opted members of the Committee also attended.

9. *Agricultural Research Sub-Committee.*—This Sub-Committee meets twice yearly just before the meetings of the full Committee and reports on the progress made on the schemes being financed by the Committee, examines fresh proposals for research schemes and studies the reports of Research Students. The following members were appointed at the November 1929 meeting of the Committee :—

The President, The Vice-President, Rao Saheb V. Krishna Menon, Messrs. A. Howard, W. Roberts, W. Ellis Jones, T. F. Main, G. R. Hilson, F. J. Plymen, D. Milne ; Messrs. G. C. R. Coleridge, B. C. Burt, C. V. Sane, G. Clarke, Drs. L. C. Coleman, W. Burns, Seth Kasturbhai Lalbhai (additional members) ; Messrs. Trevor Trought and P. B. Richards (co-opted members), and the Secretary.

At the July 1930 meeting Mr. R. G. Allan and Dr. V. N. Likhite replaced Messrs. F. J. Plymen and C. V. Sane respectively and Messrs. D. N. Mahta, W. J. Jenkins, Ram Prasad, Roger Thomas and Sir Joseph A. Kay were co-opted on the Sub-Committee. Sardar Sampuran Singh will in future take the place of Rao Saheb V. Krishna Menon, retired. Mr. G. Clarke is no longer a member of the Committee.

10. *Technological Research Sub-Committee.*—This Sub-Committee meets generally during the meetings of the full Committee with occasionally an extra session. It concerns itself with all matters pertaining to the Technological Laboratory and Technological Research. It held three meetings during the year. The following members were appointed in November 1929 :—

The President, The Vice-President, Sir Purshotamdas Thakurdas, Sir Sorabji B. Mehta, Seth Kasturbhai Lalbhai, Messrs. W. Ellis Jones, G. C. R. Coleridge, D. Milne, A. Howard, B. C. Burt, T. F. Main, G. R. Hilson, and the Secretary.

As a result of a recommendation of a special joint meeting of representatives of the East India Cotton Association, the Bombay Millowners' Association and the local members of the Indian Central Cotton Committee held on the 4th September 1929 to consider means whereby the Laboratory could be made of more practical utility to the cotton trade, it was decided to co-opt on this Sub-Committee two representatives each from the East India Cotton Association, the Bombay Millowners' Association and the Ahmedabad Millowners' Association.

Sir Joseph Kay was invited to attend the July meeting of this Sub-Committee.

11. *Research Students' Selection Sub-Committee.*—This Sub-Committee did not meet during the year as no scholarships were allotted.

12. The following Special Sub-Committees were appointed and met during the year :—

(1) A joint meeting of representatives of the East India Cotton Association, the Bombay Millowners' Association and the Bombay members of the Indian Central Cotton Committee was held at the Technological Laboratory in September 1929 to consider means whereby the Laboratory could be made of more practical utility to the cotton trade.

(2) A special meeting of the Bombay members of the Committee was held on the 3rd December 1929 to formulate a reply to a telegram from the Government of India on the question whether a reduction in railway freight would benefit the cotton grower.

(3) Special Selection Sub-Committees were also appointed to consider applications for the posts of Assistant Director of the Technological Laboratory, Deputy Secretary of the Committee and Cotton Botanist for the co-ordination of cotton research in Bombay Presidency.

13. Much of the detailed work is carried out through the medium of these several Sub-Committees and the brunt of the work falls on the shoulders of those members resident in Bombay. As usual they have continued to give ungrudgingly of their time and to them in particular the thanks of the Committee are due.

MEETINGS.

14. The Central Cotton Committee met twice during the year, viz., on the 11th November 1929 at Indore and on the 30th June and 1st July 1930 in Bombay. The meeting at Indore was the first held out of Bombay and gave effect to a resolution passed in 1928 that one cold weather meeting should be held at Indore once in three years to enable members to see the work in progress at the Central Agricultural Institute for cotton. At the twenty-first meeting, the Director of Agriculture, Punjab, extended to the Committee an invitation from his Government to hold the twenty-second meeting at Lahore, so that members might get into personal touch with the work and problems in that Province. This offer was accepted but subsequently it was found that the majority of the commercial representatives would be unable to leave their headquarters for a period which would entail a week's absence and the *venue* has been changed to Bombay. At the Indore meeting, the following gentlemen attended as visitors :—

The Hon'ble Col. H. R. N. Pritchard, C.I.E., O.B.E., Agent to the Governor-General, Central India States ;

Rao Bahadur Sardar M. V. Kibe, M.A., Deputy Prime Minister, Indore ;

Mr. Motilal Bijawargi, M.A., LL.B., Finance Minister, Indore ;

Lala Shreeman Singh, M.A. (Oxon.), General Minister, Indore ;

Mr. K. G. Reshimwale, B.A., Revenue Minister, Indore ;

Lt.-Col. J. S. Barker, M.V.O., R.E., Member, Public Works Department, Indore ;

Mr. Nihalchand, M.A., Abkari Member, Indore ;

Mr. N. G. Khasgiwale, B.A., LL.B., Dewan Khasgi, Indore ;

Mr. K. B. Tilloo, Settlement Officer, Indore ;

Mr. S. V. Kanungo, M.A., Commissioner of Customs, Indore ;

Rao Saheb S. L. Tambe, B.A., Rural Development Commissioner, Indore ;

Dr. V. A. Sukhtankar, Ph.D., Director, School Education, Indore ;

Mr. V. G. Apte, M.A., Subba of Indore District ;

Mr. Madhaorao N. Jagdale, Assistant Household Officer, Indore ;

Dewan Bahadur Sardar Pandit Narayan Prasad, Minister, Dewas (Senior Branch) ;

Khan Bahadur Malik Fateh Khan Noon, P.C.S., Deputy Registrar, Co-operative Societies, Punjab, Lahore ;

Mr. K. Sawhney, M.Sc., Cotton Research Botanist, Parbhani ;

Mr. S. S. Salimath, Deputy Director of Agriculture, Dharwar, and

Mr. V. R. Dharwarkar, Deputy Director of Agriculture, Parbhani.

The twenty-first meeting was privileged to receive a visit from His Excellency the Right Hon'ble Sir Frederick Hugh Sykes, P.C., G.C.I.E., G.B.E., K.C.B., C.M.G., Governor of Bombay, who delivered a long and inspiring address which was greatly appreciated. Other visitors at this meeting included Mr. H. H. Lakin and Mr. Madhowji D. Thackersey.

In Appendix I will be found a list of the more important resolutions passed at the two meetings of the Central Cotton Committee during the year.

STAFF.

15. Mr. J. H. Ritchie returned from leave on November 11th, 1929, and resumed charge of the office of Secretary on November 13th.

Dr. A James Turner returned from leave on the 6th December 1929 and assumed charge from Mr. Richardson. Mr. Richardson proceeded on three months and 17 days' leave on the 2nd June 1930, Mr. N. Iyengar being appointed to officiate for him during his absence.

From a large number of applicants a Selection Sub-Committee appointed Dr. Nazir Ahmad, Professor of Physics at the Islamia College, Lahore, to the post of Assistant Director of the Technological Laboratory. Dr. Ahmad joined duty on the 17th March 1930.

Mr. Trevor Trought was granted 8 months' leave from the 23rd March at the end of his first term of agreement with the Committee. Mr. Trought has renewed his agreement for a further period of five years.

Mr. Jenkins was permitted by the Standing Finance Sub-Committee to accept the post of Chief Agricultural Officer, Sind, which was offered to him by the Bombay Government, and he handed over charge of his duties of Deputy Secretary on the afternoon of the 31st May 1930. At its ninty-fourth meeting, the Standing Finance Sub-Committee passed a resolution acknowledging his services to the Committee.

The Committee will suffer a serious loss in December when Dr. A James Turner, Director of the Technological Laboratory, leaves to take up an important appointment in Manchester. During the seven short years of his connection with the Committee, Dr. Turner has built up a Research Laboratory which is at present the only one of its kind in the world, and the best testimonial that can be paid to it is to be found in the fact that it is being copied in other parts of the world. He will leave behind him a Research Institute which has already earned for itself a world-wide reputation and which apart from its value to the cotton breeder is becoming of increasing value to the trade.

The Committee has to record the loss to cotton work in India of Dr. W. Youngman, late Economic Botanist for Cotton in the Central Provinces and Berar and now Director of Agriculture, Ceylon. Dr. Youngman was eminently successful in his efforts to obtain a wilt-resistant, high-yielding, good quality cotton for the Central Provinces and Berar and the extended cultivation of *Verum* 262 is ample evidence of the popularity of the new strain and the success of his work.

The Committee wishes to record its deep sense of loss in the death of Mrs. G. L. C. Howard, who has been in charge of the cotton physiological work from the opening of the Institute of Plant Industry at Indore. The name of the Howards, husband and wife, is almost a household word in botanical circles, especially in India, which can ill-spare a scientist of her outstanding ability. The Standing Finance Sub-Committee passed and forwarded to Mr. Howard a resolution of condolence.

The Standing Finance Sub-Committee also forwarded to Dewan Bahadur Sir T. Vijayaraghavachariar, its President, a resolution expressing its sympathy at the unfortunate death of his son, who met with a fatal accident in Madras at the commencement of a promising career in the Indian Civil Service.

16. *Provincial and Local Cotton Committees.*—The following Provincial (Divisional) and Local Cotton Committees met during the year ending 31st August 1930 :—

The Punjab Provincial Cotton Committee, Tuticorin Cotton Sub-Committee and the Gujerat Divisional Cotton Committee each met once during the year.

There are indications that some, at least, of these Cotton Committees are beginning to realise that they have it in their power to be of considerable help to their Provinces in all matters connected with cotton. It is unfortunately true that in the past co-operation between the Central Cotton Committee and the Provinces has been possible only through the medium of the Agricultural Departments and not, as it should be, through Provincial Cotton Committees. There is a tendency for some Provinces to refer to the Central Cotton Committee all cotton matters, many of which could be more effectively dealt with by a live Provincial or Divisional Committee. It is greatly to be hoped that this awakening of interest will continue and spread and thus provide the Central Cotton Committee with an authoritative body in each Province to which could be referred many problems with which the Central Cotton Committee is incapable of dealing.

CHAPTER II.

THE WORK OF THE YEAR.

17. IT was mentioned in last year's Report that the Committee had decided to help local authorities to disseminate as widely as possible the results of the research schemes financed from the Committee's grants. This policy has been translated into action in the year under report in the case of two schemes which have reached maturity, viz., the extension of the area under *Verum* cotton in the Central Provinces and Berar and in the Surat area where the Committee has approved of funds for a campaign against the *Earias* Boll-worms. In the year under review the Agricultural Department in the Central Provinces made arrangements to market that portion of the *Verum* crop which had been grown under supervision and about 6,500 bales were sold at an average premium of Rs. 30 to Rs. 34 per khandy *on* Broach. For marketing the crop of the coming season, estimated to amount to 40,000 bales, the Committee offered considerable financial help but the Central Provinces Government agreed to find the necessary finance. The intention of the Agricultural Department is to obtain for the growers the best possible rate for the new strain, to prevent the cotton falling into the hands of merchants who might use it for mixing, and to obtain a large supply of pure seed which it is hoped will be sufficient to sow a million acres in the 1931-32 season. It is hoped to establish next year large compact blocks of pure *Verum* cotton in certain areas in Berar and the Central Provinces so that the produce coming into certain markets will be nothing but *Verum*. Both the Department and the Committee are anxious that a valuable cotton such as *Verum* should not suffer the fate of certain other varieties in India which have not secured their intrinsic value due to the malpractice of mixing with inferior varieties.

The investigators, working on the Surat Entomological Scheme, have come to the conclusion that the best method of combating the *Earias* Boll-worms in that area is to carry out an intensive clean-up campaign at the end of the cotton season. The pest is carried over from season to season in cotton stubble and certain alternative host plants and it is intended to eradicate these over a wide area for a number of years to see the effect on the crop produced.

18. In a resolution passed at the monsoon meeting the Committee drew the attention of the Government of India to the low level of cotton prices which, in their opinion, were below cost of production, and requested Government to devise some scheme to come to the aid of the grower in the event of the price of cotton going below certain basic figures. The Committee ultimately put forward a scheme to facilitate the provision of credit which would help both growers and merchants. This scheme the Government of India was unable to accept as in their opinion it entailed

the fixing of a minimum price for cotton. The Committee was, however, instrumental in obtaining a reduction in the margins required by the Imperial Bank in up-country centres from 30 per cent. to 25 per cent.

19. As a consequence of the unfavourable prices obtained for Indian cotton during the preceding season, the area of cotton in India, during the year under review, fell to 25,692,000 acres from 27,053,000 acres in the previous year, a decrease of 5 per cent. The season was fair on the whole, though the crops in the Broach, Khandesh, Berar and Westerns and Northerns tracts were adversely affected by unseasonable weather conditions during the growing season. The total estimated yield and the average yield per acre were comparatively low, being only 5,260,000 bales of 400 lbs. and 82 lbs. respectively as against a total yield of 5,811,000 bales and an average yield per acre of 86 lbs. in the 1928-29 season. The decrease in the estimated total yield was chiefly due to the reduction in the district standard outturns for cotton adopted during the year in Hyderabad for the preparation of the State forecasts.

The returns of cotton pressed and of loose cotton received by mills, however, show that the actual crop was much more than 5,260,000 bales. In British India alone the number pressed during the season 1929-30 amounted to 4,018,000 bales against an estimated yield of 3,548,000 bales, while in those Indian States which compile cotton press returns, the number was 1,222,000 bales against an estimated yield of 1,364,000 bales. The quantity of loose cotton received by the mills during the same time amounted to 112,000 bales. The cotton thus accounted for is more than the forecasted crop by about 440,000 bales. If to this is added the quantity usually accepted by the trade as being used for domestic consumption, viz., 750,000 bales and 150,000 produced by States which at present do not send in pressing returns, the crop for the 1929-30 season amounted to 6,650,000 bales. Discrepancies of almost the same magnitude have been noticed in the three previous seasons, but it is impossible to detect all the sources of error in the forecasts until press returns are available from every press in India.

After two seasons of very low consumption of Indian cotton in the mills in the Island of Bombay, the year under report showed a considerable recovery, the number of bales consumed having been 766,000. Though this was far below the 987,000 bale mark reached in 1924-25, the development of the industry outside Bombay since that year caused the total consumption of Indian cotton in 1929-30 in Indian mills to reach the highest recorded figure in the history of the Indian mill industry, viz., 2,373,000. Still more important and promising in this connection is the future outlook. If the Bombay mills re-establish their previous rate of consumption, over two and a half million bales of Indian cotton will be taken up by mills in India. The season under review has also been remarkable in another respect. The statistics of the International Federation show that during the season 1929-30 the world's total mill consumption of Indian cotton

was 6,087,000 bales, a figure which is more than the highest ever reached in past seasons by over half a million bales. All foreign consuming countries, viz., Japan, China and the United Kingdom shared in this increase while the Continent went a step further and made it a record year by having taken 1,375,000 bales against the previous record of 1,247,000 bales in the 1923-24 season.

Exports of Indian cotton during the year under review were 3,868,000 bales as against 3,933,000 bales during the previous season and 3,998,000 bales during 1924-25, the previous record season. The heavy export off-take, and the increased consumption in Indian mills had, however, comparatively little effect on the stocks of unsold cotton in Bombay on the last day of the season, as will be seen from the following table compiled from the East India Cotton Association returns :—

Descriptions.	31st August 1930.	31st August 1929.	31st August 1928.	31st August 1927.	31st August 1926.
Broach	31,012	15,053	17,242	15,463	11,493
Dholleras	37,354	40,291	60,336	33,698	30,704
Oomra	239,565	258,790	263,443	41,905	62,378
Khandesh	43,988	57,103	70,238	4,795	15,292
Bengals	28,276	63,121	50,988	12,720	24,193
Punjab-American	775	7,471	13,085	3,762	11,188
Dharwar	1,951	5,091	4,870	4,085	4,883
Comptas, Tinnevellys and Cambodia	16,785	29,249	44,346	27,218	20,486
Westerns and Northerns ..	9,048	25,486	27,404	22,628	18,158
Persian	..	31	190	200	563
Americans	297	333	2,034	1,920	460
Egyptians	..	..	..	5	7
East Africans	12,293	13,592	9,150	6,659	10,549
Other sorts	10,628	26,363	37,635	6,520	13,326
Total ..	431,972	541,974	600,961	181,578	223,680

As in the previous two years more than half the stocks consist of the short-stapled Oomras. With the exception of Broach, stocks of all stapled varieties have fallen considerably; even Bengals has shared this reduction. The shorter staple of this year's crop of Broach and Berar cottons is partly responsible for the accumulation of these varieties, while the general disinclination on the part of the mills to lay in supplies and the large carry-over from the previous season account for the absence of the substantial reduction which should have followed a year of abnormally low prices, when Indian cotton was sold below its normal parity with American.

THE COTTON TRANSPORT ACT.

20. In 1923, the Government of India, at the request of the Committee, passed the Cotton Transport Act which enables Local Governments to

prohibit the import of cotton into any area within their jurisdiction. This Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior qualities.

21. *BOMBAY.*—The Act continued in force in six zones in the Bombay Presidency during the year, viz :—

In Gujerat.—The South Surat, the Surat and the Olpad-Ankleshwar zones.

In the Southern Division.—The Kumpta-Dharwar, the Bijapur and the Bagalkot zones.

No change has taken place in the position in the Gujerat area since last year. The Government of Bombay have not agreed to a re-imposition of the road restrictions between the Surat and the Olpad-Ankleshwar zones but they have asked the Registrar, Co-operative Societies, to work out, in consultation with the Director of Agriculture, arrangements whereby "1A" cotton can be clearly distinguished from 1027. Unfortunately the 1A variety is spreading rapidly over the area so much so that it is now almost impossible to arrest the decay that has set in.

22. *THE KUMPTA-DHARWAR AREA.*—The Act worked satisfactorily in this area, the establishment of road check stations in the three zones to prevent inferior cotton entering the protected areas by road being of great help in preventing mixing.

23. *THE PROPOSED BROACH AREA.*—Part of the area proposed to be protected is included in the territories of Baroda and the States of the Rewa Kantha Agency, which has necessitated protracted correspondence with the Durbars concerned. All have finally agreed to co-operate and arrangements are now being made with the several Durbars to notify their respective areas simultaneously.

24. *BARODA.*—The three protected areas to correspond with the Gujerat zones were maintained without change during the year.

25. *RAJPIPLA.*—This State is covered by a State Law to protect the improved 1027 variety which is grown exclusively. Rajpipla cotton is now fetching the price of the best Navsari and, unless the position in Surat changes, will soon be the only reliable 1027 cotton obtainable.

26. *CHHOTA UDEPUR STATE.*—This State has in force a Law similar to the one adopted in Rajpipla and for the same purpose, viz., the preservation from adulteration of the 1027 variety of cotton by excluding other varieties from the State and by the State control of ginning and pressing factories.

27. *MADRAS.*—The result of the first year's working of the two amalgamated Southern zones confirmed the worst fears of the Agricultural Department when this retrograde step was first suggested. The free interchange of cotton in this enormous tract which grows both good and bad qualities has already had the effect of reducing the price for Tinnevelleys at Dindigul. The supply of pure seed is also being endangered. At the July meeting, the Committee drew the attention of the Madras Government to the report submitted by the Director of Agriculture with the object of having the effect of the amalgamation on the improvement of cotton within the area kept under close observation during the next year.

28. *CENTRAL PROVINCES.*—The Central Provinces Legislative Council gave their assent in January 1930 to a notification constituting Berar and the cotton-growing districts of the Central Provinces as a combined protected zone under the Cotton Transport Act. The area protected conforms to that proposed by the Central Cotton Committee.

29. *INDORE.*—A Bill on the lines of the Act in British India with the modifications necessary to suit local conditions was placed before the Legislative Committee, was passed, received the assent of the Durbar and came into force from 1st June 1930. Protection will be obtained from import by rail only as the checking of imports by road is impracticable. This step was urged by the Central Cotton Committee to prevent the deterioration of the valuable Malwa cottons by admixture with 'inferior' Rajputanas.

Similar action may now be taken by Gwalior State.

30. *HYDERABAD.*—The Hyderabad State Cotton Cultivation and Transport Act was drawn up on the lines of the Cotton Transport Act of British India and is meant to protect the valuable *Bani* or *Gaorani* cotton over a big area in the State. The Act also gives power to the authorities to specify the type of cotton that may be grown. A new protected area was notified during the year in the Raichur District.

31. *SANGLI.*—His Highness the Chief of Sangli notified that the rules under the Cotton Transport Act, 1923, as framed by the Bombay Government with subsequent amendments were introduced *mutatis mutandis* into the State from 1st July 1930.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

32. The amendment to Rule 7 of the Rules under the Cotton Ginning and Pressing Factories Act, mentioned in last year's Report, has supplied to the Act a much needed measure of resilience. Even in the slump in the price of cotton which was the most unsatisfactory feature of the year, no complaints were received of bales having been rejected because of minor faults in marking. The latitude which the amendment now permits has done much to reconcile recalcitrants to the Act and there should be no complaints in future on this score.

At the request of the Central Cotton Committee the Karachi Joint Cotton Committee brought into force as from 17th November 1930 their amended by-laws enforcing the provisions of Section 14 of the Act. This section lays down that " any person who has made a contract for the purchase of baled cotton may require that no bales other than bales marked in accordance with Section 4 shall be supplied in fulfilment of such contract and, if he does so require, no bale not so marked shall be tenderable in fulfilment of the contract." This action on the part of the Karachi Joint Cotton Committee has removed the grievance of Bombay merchants that bales which would be rejected in Bombay would pass at Karachi because the market there had not incorporated in its by-laws the necessary provisions.

Arising out of the prosecution of a factory owner in Khandesh for failure to mark bales, the Solicitor to the Government of India upheld the opinion of the Assistant Public Prosecutor, East Khandesh, that a certified copy of an arbitration award of the East India Cotton Association could not take the place of the witnesses who had actually seen the bales in question. As it is impossible to expect arbitrators to present themselves in courts in any part of India the Committee asked the Government of India to amend the Act so as to ensure that a duly certified arbitration award of a regularly constituted cotton trading association shall be admissible as evidence in a Court of Law. To this request the Government of India were unable to agree and the Committee is now in consultation with the East India Cotton Association to find a way out of the *impasse.*

The Committee continued to bring to the notice of the authorities concerned all cases of faultily marked bales. Six cases were reported during the year, two resulting in prosecution and fine. The owner of a factory in Sailu, Hyderabad State, was warned by the State authorities that a repetition of failure to mark bales would result in his factory being closed down. One case reported by the East India Cotton Association appeared to be one of false marking. On enquiry it was found that the press owner, in addition to marking the hoops with the press mark prescribed for the factory, also stencilled on the *hessian* of some bales the name of a place in an Indian State which had a better reputation in the Bombay market. The importance of buying on press marks only is therefore apparent.

Four cases have been reported of prosecutions for non-compliance with the structural requirements required under Section 9 (1) (*b*) of the Cotton Ginning and Pressing Factories Act. The owners were prosecuted and fined for not having the plans of their ginneries first approved by the authorities.

33. The marking of bales is now in force in the following Indian States:—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Cambay, Chhota Udepur, Datia, Dhar, Dhrangadhra, Faridkot,

Gondal, Hyderabad (the Nizam's Dominions), Idar, Indore, Jaipur, Jamkhandi, Jaora, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kolhapur, Lakhtar, Limbdi, Manavadar, Miraj (Sr.), Morvi, Mudhol, Muli, Mysore, Nabha, Navanagar, Porebunder, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargadh, Savanur, Shahpura, Tonk, Wadhwan and Wankaner.

2. Weekly cotton press returns are sent by all the above States except Datia, Dhar, Kolhapur, Lakhtar, Miraj (Sr.), Mysore, Radhanpur, Sachin and Sangli.

Gwalior is now the only large Indian State which has not introduced legislation for the marking of bales, and the Central Cotton Committee at its monsoon meeting requested the Durbar to introduce an Act for the regulation of the Cotton Ginning and Pressing Factories in the State. The matter has been taken up by the Durbar and the Committee hopes to see an Act in force before the 1931-32 cotton season.

The Committee also requested the Government of India to ascertain through the Political Department particulars of area of the cotton grown in all non-reporting Indian States, the number of ginning and pressing factories, if any, and the principal markets for such cottons. States having a minimum area of 5,000 acres under cotton were also requested to issue forecasts if they do not already do so. This information will be greatly appreciated by the officers responsible for the preparation of the Provincial forecasts.

MALPRACTICES.

34. Nine cases of bales having been rejected for containing damp cotton and one case of old crop cotton being mixed with new cotton were reported by the East India Cotton Association. Of the nine cases of watering, four were in Punjab cotton, two in Broach, two in Hyderabad and one in Central Provinces. In each case a certified copy of the press register relating to the cotton was called for and forwarded to the East India Cotton Association for posting. In Hyderabad State, watering is a penal offence and the Director-General of Commerce and Industries was compelled to shut down three factories in the State for this malpractice. This strong action should have a most beneficial effect in the coming year.

The Central Cotton Committee drew the attention of the Bombay Government to the increasing malpractice of watering in Hubli and Gadag and recommended that Collectors should follow the practice adopted in the Central Provinces of discouraging press owners who were known to practice this form of fraud. This suggestion was accepted and passed on to the District Officers.

The Sub-Committee on Malpractices confined its attention during the year to the problems of mixing of Punjab-American cotton with *desi* and the effect of 'pools' of cotton ginning and pressing factories on the price paid to the grower for his produce. As mentioned in last year's Report, the Committee made an offer to the Punjab Government to provide for one year half the cost of the staff required to organize co-operative sale societies for the production and marketing of pure Punjab-American cotton up to a maximum of Rs. 5,000. This offer was placed by the Director of Agriculture before the Punjab Provincial Cotton Committee, which approved of the grant subject to permission being given to these sale societies to deal with other crops like wheat and *desi* cotton. The Central Cotton Committee was unable to accept this proviso as the sale of *desi* cotton would not discourage mixing, which was the Committee's intention. The subject is still under the consideration of the Punjab Government.

Regarding 'pools' of cotton ginning and pressing factories the Sub-Committee felt that an investigation was necessary in order to ascertain whether pooling was the cause of unduly high prices. It was thought that a reference made to the trade itself would give an amount of data sufficient for the Sub-Committee to work on. Consequently a *questionnaire* was drawn up for ginning and pressing factories separately and these were sent to every ginning and pressing factory in India. 2,750 ginning factories and 762 pressing factories were addressed but the number of replies received only amounted to 71 and 57 respectively. Moreover, the majority of the replies were of so little value that the Central Cotton Committee decided at its July meeting that Local Governments should be asked to make enquiries on the effect of ' pools ' on the price charged for ginning and pressing and that special enquiries should be carried out in localised areas in Surat, Khandesh, and in the Central Provinces at the expense of the Committee. This request is still under the consideration of certain Local Governments, but it is hoped to obtain reliable data this year for Bombay Presidency, the Central Provinces and Berar and for Ajmer-Merwara. The Punjab Government has already supplied certain figures which will prove of great value to the Sub-Committee when framing its proposals.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

35. The Special Sub-Committee which dealt with these reports made certain general recommendations which were printed with the reports and brought to the notice of the Local Governments concerned. The recommendations on the Sind, Middle Gujerat and Khandesh reports were :—

(1) That Co-operative Sale Societies should be formed to provide the growers with a better outlet for their produce ;

(2) that the attention of the Bombay Government should be drawn to the general use of false weights and scales in the villages in Sind,

and district authorities should be requested to take action under the Indian Penal Code and under the Bombay Act III (District Municipal Act) of 1901 ;

(3) that uniform weights should be employed in the villages ;

(4) that steps should be taken to standardise the levies and deductions in the markets ;

(5) that cotton growers would benefit if the principal markets in Khandesh were better regulated ;

(6) that the reports should be translated into the local vernaculars, the cost of printing being borne by the Committee.

The action so far taken has been the passing of the Bombay Cotton Markets Act which gives local authorities power to establish regulated open markets. The standardisation of weights and measures is under consideration. The question of Co-operative Sale Societies has been referred to the Registrar, Co-operative Societies, and the translation of the reports into the local vernaculars has been deferred.

In the Madras Report, the Sub-Committee recommended :—

(1) that open regulated markets similar to those proposed for Bombay Presidency should be established, with the growers fully represented on the Market Committees ;

(2) a regular market place should be provided at Adoni ;

(3) *dalalidars* and weighmen should be licensed, deductions and levies standardised and weights certified and tested ;

(4) Co-operative Sale Societies should also be organized in suitable places ;

(5) the report should be translated into Telugu and Kanarese.

This last suggestion was accepted and the report has been translated and printed in the two vernaculars. Legislation for the establishment of regulated markets for all commercial crops is under consideration. The Municipal Council of Adoni was asked to send proposals to Government for the provision of a suitable cotton market in that town and the question of a loan for the acquisition of land is under the consideration of Government. Government has sanctioned the appointment of a Deputy Director of Agriculture for a period of two years to work under the Registrar of Co-operative Societies for the development of Cotton Sale Societies in the principal cotton areas in the Presidency.

The Report on the Enquiry in Berar made no specific recommendations, but the faults and shortcomings of the Berar markets were brought to light. The Central Provinces Government has now amended the Rules under the Berar Cotton and Grain Markets Law under which these markets are administered, and it is hoped they will be brought into force at an early date. The translation of the report into Marathi has also been carried out.

The recommendations made to the Punjab Government in the Punjab Enquiry Report were that

(1) more Co-operative Credit Societies should be formed to provide cheaper money for the growers;

(2) efforts should be made to organize Co-operative Sale Societies;

(3) the establishment of open regulated markets based on those in Berar with the modifications incorporated in the Bombay Cotton Markets Act was desirable;

(4) the Government of the Punjab should institute an enquiry into the effect of ginning and pressing 'pools' on ginning and pressing rates and measures should be devised to check this tendency if it is found that the grower is obtaining less for his produce in consequence;

(5) the report should be translated into the local vernacular.

This last item is being done. The question of the establishment of open regulated markets is being carefully examined and material is being collected. Suitable legislation will be introduced in due course. Information on the effect of ginning and pressing pools has been collected and the conclusion arrived at that where 'pools' existed last year charges were higher than where there were no pools. The Co-operative Department is ready to give every encouragement to the formation of Co-operative Sale Societies for cotton.

COTTON MARKETS.

36. Considerable progress has been made during the year in consolidating the position regarding the establishment of open regulated cotton markets in different parts of India.

Since the last Annual Report was published, the Hyderabad Agricultural Markets Bill has passed into law. Rules have also been drafted and received the approval of the Local Sub-Committee of the Central Cotton Committee. They are still under the consideration of H. E. H. the Nizam's Government. The Act and Rules follow closely those adopted for Bombay but provision has been made to extend them to other commodities besides cotton, if necessary.

The Rules under the Bombay Cotton Markets Act received the approval of the Legislative Council and have now been finally adopted. With the exception of a few minor changes they agree with the draft rules drawn up by the Local Sub-Committee. As requested by the Committee the Rules are being translated into the several vernaculars of the Province.

Rules for the regulation of cotton marketing in Indore City were published in the *Holkar Sirkar Gazette* in November 1929. They follow the same general lines of the other four regulated markets in the State with differences in details only.

A Bill for the regulation of markets for commercial crops in the Madras Presidency is under the consideration of Government. This will include cotton along with other crops.

The revised rules under the Berar Cotton and Grain Markets Law are still under the consideration of the Central Provinces Government.

The Committee is giving earnest thought to the question of Universal Standards for Indian cotton, the first step towards which is the adoption of common standards in the different markets in India itself. Negotiations have been proceeding between the East India Cotton Association and the Karachi Joint Cotton Committee on this important subject and a considerable amount of uniformity has already been achieved.

MARKETING OF IMPROVED VARIETIES OF COTTON.

37. The Technological Reports on Standard Indian Cottons were supplied as usual to the trade. These reports give details of the area, estimated outturns and spinning capabilities of improved cottons introduced by the Department of Agriculture. Further details will be found in the report of the Director, Technological Laboratory. The strong demand for these improved varieties ensures for them a satisfactory premium though certain of them can with difficulty be obtained pure as they are mixed with inferior varieties and sold on type.

38. Through the courtesy of the Board of the East India Cotton Association the Committee sent this year to the Manchester Cotton Association complimentary standards of Sind cotton representing Sind Good, Sind Good to Fully Good, Sind Fully Good, Sind Fine and Sind Superfine. Last year *replicas* of the official standards of the East India Cotton Association for Fully Good M. G. Bengals contract of M. G. Punjab and Fully Good M. G. Broach contract of M. G. Punjab-American were sent. In view of the increasing interest being shown by English spinners in Indian cottons, these standards should prove of great value for reference.

COTTON MARKETING IN KARACHI.

39. It was mentioned in last year's report that the Karachi Joint Cotton Committee agreed, as an experimental measure for one year, to lower

their standard for Punjab-American cotton to 6/8" so as to bring it into conformity with the standard in Bombay. The Joint Committee has now decided to continue with the 6/8" staple but to fix 'on' allowances for better staple.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

40. *The Mexican Boll-weevil.*—With a view to prevent the introduction into India through imported American cotton of the most serious of all cotton pests, viz., the Mexican cotton boll-weevil (*Anthonomus grandis*), the Government of India, at the instance of the Indian Central Cotton Committee, has restricted, since 1925, the import of American cotton to a single port, namely Bombay, and only after fumigation with hydrocyanic acid gas. During the year under review 12,759 bales were fumigated at Bombay. On account of the small imports it was not possible for the Committee to recommend any rebate of fumigation fees as was done in 1927 and 1928, but an important concession in the matter of remission or refund, in certain circumstances, of the extra fumigation charges levied by way of penalty from importers for not complying fully with the existing rules, was granted by the Government of India in their Notification No. 566-Agri., dated the 19th March 1930, and the special orders issued thereunder.

41. *The Red (Sudan) Boll-worm.*—To prevent the risk of introducing new insect pests such as the Red (Sudan) Boll-worm (*Diparopsis castanea Hamps*) through imported cotton seed, the Government of India, on a recommendation of the Indian Central Cotton Committee made in 1927, has now prohibited entirely the import of cotton seed by sea except that quantity required for experimental purposes by certain officers authorised in the Government of India Notification No. 1213-Agri., dated the 27th May 1930, in the Department of Education, Health and Lands. It has also been laid down that such imports shall be through the port of Bombay only, in quantities not exceeding one hundredweight in any one consignment, and subject to fumigation, if necessary. The Secretary and Deputy Secretary of the Indian Central Cotton Committee have been authorised to examine such consignments and fumigate them, if necessary.

COTTON STATISTICS.

42. *Cotton forecasts.*—The arrangement made in 1928 to improve the accuracy of the fifth cotton forecast (Supplementary Memorandum) issued in April by including in it revised estimates from all the principal cotton-growing Provinces and States worked satisfactorily during the year under report. Besides Bombay, Hyderabad and Madras, which are the three Provinces principally concerned at the time of the issue of the fifth forecast, the United Provinces, the Central Provinces and Berar, the Punjab and Central India revised their estimates of the crop.

It has long been a standing complaint that the publication of the cotton forecasts in Calcutta placed the cotton trade of Bombay at a great disadvantage. This has now been remedied by an arrangement introduced with effect from the first forecast for the season 1930-31 by which the forecast figures are telegraphed by the Director-General of Commercial Intelligence and Statistics to the Secretary, Indian Central Cotton Committee, in time to enable the latter to post the figures at the offices of the East India Cotton Association, Ltd., Bombay, simultaneously with the release of the forecast at Calcutta.

43. *Cotton press returns.*—The efforts of the Committee to enlist the co-operation of those Indian States, which have cotton pressing factories within their territories, to compile weekly cotton press returns, have been successful beyond all expectation. During the year under report forty Indian States compiled such returns, which together with those from British Provinces accounted for about 93 per cent. of the estimated crop. The States of Gwalior, Mewar, Patiala and Mysore absorb 4 per cent. of the balance, but the Committee is hopeful that these 4 important States will introduce the necessary legislation in the coming season. Until all States furnish press returns, the statistics of cotton pressed in India must remain incomplete, and one of the important uses of such figures, viz., that of checking the accuracy of cotton forecasts, will remain imperfect.

A comparison of the season's press returns with the forecasted crop confirms on the whole the results obtained in previous seasons. In the Gujerat block, in the Punjab, and in Sind there is, as usual, an excess of cotton pressed over the estimated crop. The press returns of the Kathiawar States adjoining the Gujerat block show deficits, which indicate that part of the excess in the Gujerat block is accounted for by cotton grown in these States. With regard to the Punjab no improvement is possible until all the States in the Punjab compile cotton forecasts. An effort is now being made through the Government of India to obtain from all those States, for which information is lacking, complete and up-to-date information on the quantity of cotton produced, and its distribution.

44. *Raw cotton trade statistics.*—The nature and scope of the recently re-introduced rail and river-borne raw cotton trade statistics have been referred to in previous reports. As the first of these returns is for the month of October 1928, the statistics for the season 1928-29 are incomplete. However, an examination of the figures for the eleven months ending 31st August 1929 confirms the points already brought to light from a study of the press returns, viz., that the cotton crops of the 1928-29 season in the Punjab, Sind and the Central Provinces and Berar were all underestimated in the forecasts, while in the United Provinces there was a deficit in the pressing returns which may be explained as being due to local consumption. In the Hyderabad State the visible supply shown by nett exports and mill consumption or by press returns was actually less than half the estimated crop. It is evident that this large difference cannot be explained away as being due to

export by road of cotton in the form of *kapas* or unpressed cotton. It is greatly to be hoped that the revised standard normal outturns for cotton adopted in the State during the season 1929-30 will produce a greater measure of agreement between the forecasts, the press returns, and the trade statistics.

45. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for Indian mills of American cotton, the arrivals, and the quantity at sea. Importers and millowners of Bombay continued, as before, to furnish the Committee confidentially from time to time with information regarding their purchases of American cotton, and the Committee again wishes to record its thanks to them for their valued co-operation.

46. *Cotton consumption.*—The compilation and publication of the monthly statements* (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States and (3) of loose cotton received in the mills in the major cotton-growing Provinces was continued. In addition a consolidated monthly statement showing the total consumption in "British India" and in "Indian States," during the month and since the commencement of the season, with corresponding figures for the previous season, is sent for publication in the daily Press as soon as figures are available. In this way a brief statement of consumption appears in the Press much earlier than the detailed statements in the *Indian Trade Journal.* The second part of the statement referred to was compiled in the past from voluntary returns of actual raw cotton consumed in the mills in Hyderabad, Mysore, Baroda, Gwalior and Indore States, and from yarn production in other States. It is gratifying to be able to record that the Committee has recently been successful in enlisting the co-operation of the States of Cochin, Cambay, Rajkot, Kishengarh, Raj-Nandgaon, Bhavnagar and Kolhapur which have agreed to supply voluntarily returns of actual raw cotton consumed in the mills situated in these territories instead of as formerly the amount of yarn manufactured.

COLLECTION AND SUPPLY OF INFORMATION.

47. As in past years a note on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton was contributed to the Bombay Cotton Annual published by the East India Cotton Association. This note is given in Appendix IV. In addition, notes on the working of the Cotton Transport Act, the Cotton Ginning and Pressing Factories Act, and other information and statistics of general interest to the trade were also supplied.

48. The system introduced last year of circulating the more scientific and technical journals between the cotton research institutions financed

* Appendix III.

by the Committee worked satisfactorily during the year. This was devised to prevent the unnecessary duplication of literature purchased out of the Committee's funds, and also to afford an opportunity to the *mofussil* research worker to peruse literature of a more scientific nature than he normally would.

49. The Committee has again to record its thanks to those private and public institutions which maintain on their free mailing list the name of the Committee. In particular the Committee is indebted to the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, to the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to members.

PUBLICATIONS.

50. The following bulletins and reports were published during the year :—

(1) Report on an investigation into the Finance and Marketing of Cultivators' Cotton in the Punjab.

(2) The Present Position of the Research Schemes of the Indian Central Cotton Committee.

(3) The Marathi translation of the Report on the investigation into the Finance and Marketing of Cultivators' Cotton in Berar.

(4) A Comparison of some Methods of Testing the Breaking Strength of Single Cotton Fibres (Technological Bulletin B-5).

(5) Studies in the Sampling of Cotton for the Determination of Fibre-Properties (Technological Bulletin B-6).

(6) Technological Reports on Standard Indian Cottons, 1930 (Technological Bulletin A-14).

(7) Preliminary Spinning Tests on Mixings of Indian and American Cottons using Ordinary and High Drafts (Technological Bulletin A-15).

(8) Technological Report on Banilla Cotton (Technological Bulletin A-16).

(9) Spinning Test Reports on 1929-30 samples of :—

(*a*) Fine and Superfine Khandesh Cottons (Technological Circular No. 23).

(*b*) Fine and Superfine C. P. No. 1 Cottons (Technological Circular No. 24).

(*c*) Fine and Superfine Berar Cottons (Technological Circular No. 25).

(*d*) Fully Good and Fine Muttia Cottons (Technological Circular No. 26).

(*e*) Latur, Nanded and Punjab-American Cottons (Technological Circular No. 27).

(*f*) Dholleras and Kadi/Viramgaum Cottons (Technological Circular No. 28).

(*g*) Broach Cottons (Technological Circular No. 29).

(*h*) Jagadia Farm, Surat and Navsari Cottons (Technological Circular No. 30).

(*i*) Kalagin Cotton (Technological Circular No. 31).

(*j*) Farm Western, Bijapur and Bagalkote Cottons (Technological Circular No. 32).

(*k*) Coompta, Cambodia and Karunganni Cottons (Technological Circular No. 33).

(*l*) Westerns, Gadag-Upland and Tinnevelly Cottons (Technological Circular No. 34).

SECRETARY'S TOURS.

51. I paid visits to the following places during the year in connection with the work of the Committee :—

Pusa, Madras, Coimbatore, Bangalore, Dharwar, Hubli, Poona, Raya Farm, Cawnpore, Lahore, Sargodha, Okara, Lyallpur and Simla.

Mr. W. J. Jenkins, Deputy Secretary, while officiating as Secretary, visited Nasik, Hubli, Madras, Secunderabad, Parbhani, Poona, Lahore, Lyallpur, Delhi and Indore.

FINANCIAL.

52. In Appendix V will be found statements showing the Receipts and Expenditure and also the Balance Sheet for the year ending March 31st, 1930. Receipts amounted to approximately Rs. 8,94,711 and expenditure to Rs. 6,56,378. The estimated expenditure was Rs. 8,80,979, the chief savings being under Administration, the Madras Pempheres and Physiological Scheme, Research Studentships, Co-ordination of Cotton Research in the Bombay Presidency and Working Expenses of the Technological Laboratory. In the current year, receipts are estimated at Rs. 7,46,000 and expenditure at Rs. 9,09,577.

CHAPTER III.

RESEARCH.

53. The Indian Cotton Cess Act was passed in 1923 for the improvement and development of the growing, marketing and manufacture of cotton in India and the Committee's funds are devoted to that end. In the domain of agricultural research, the Committee subsidises Provincial Departments of Agriculture for the purpose of carrying out definite schemes which have been approved by the Committee. This constitutes the principal line of attack. The Committee also provides a large sum annually to the Institute of Plant Industry, Indore, which is a central research institute for cotton and general agricultural problems in the black cotton soils of Central India. The extension of improved varieties of cotton already in cultivation is also receiving the close attention of the Committee. Grants to Local Governments for carrying out investigations into the finance and marketing of cultivators' cotton have also been provided, and at its last meeting, the Committee agreed to finance enquiries in different Provinces into the effect of 'pools' of ginning and pressing factories on the price paid to the grower for his cotton. Technological research is under the direct control of the Committee at its Technological Laboratory at Matunga, Bombay, although, in addition, Technological Assistants are stationed at Lyallpur, Dharwar and Coimbatore to aid the Cotton Breeders there in the simpler forms of research on the cotton fibre.

TECHNOLOGICAL LABORATORY.

54. The Report of the Director, Technological Laboratory, will be found in Chapter V. There has been a continuous expansion of the work in both branches of the Laboratory since it was opened in 1924 and the facilities are now strained to the uttermost. The number of samples spun for Agricultural Departments this year showed a 71 per cent. increase over last year, which was itself a record year. In order to deal with this large number of tests special arrangements had to be made both in spinning and in testing. The large increase in the number of samples is mainly due to the fact that many of the agricultural research schemes being financed by the Committee are now coming to the stage, where the spinning test is the chief determining factor in the further progress of the work. In addition, testing of 24 (21 Indian and 3 American) standard cottons was carried out as usual, while a beginning was made in carrying out tests for the trade. Twenty-nine samples supplied by the East India Cotton Association, representing the average commercial crop of the year, were tested. Arrangements have also been made with the Millowners' Association of Bombay and Ahmedabad to test from the present year the first arrivals of the season of 23 cottons. The Laboratory will thus, in future, carry out three series of tests on the Indian cotton crop each season.

55. The tests on blow-room and card-room losses in the standard commercial cottons were completed during the year. The results are very instructive, varying as they do in the different varieties from 9.85 per cent. (combined loss) in Superfine C. P. to 28.24 per cent. in Gadag Upland Fully Good. Tests were also made on two systems of high draft spinning. Spinning of mixings of Indian and American cottons was carried out on the different systems and compared. A summary of the results will be found in the Director's Report. Arrangements have been made recently to install two other types of high draft for comparison with each other. Limit spinning tests on two cottons, Cambodia Co. 1 and Mollisoni, were completed during the year. It was found possible to spin the former up to 70's counts from single roving, although according to the scale adopted at the Laboratory, it is adjudged suitable for 36s warp counts only. The economic limit was found to be 52s with a 4 twist constant and 56s with a $4\frac{1}{2}$ twist constant. Mollisoni was spun up to 16s but even at 8-12s counts it was only with the twist constants at $4\frac{1}{2}$ and upwards that the number of breakages was reduced to an extent to make the spinning economic. Four other cottons will be taken up and the series of six will cover a wide range of spinning qualities.

During the year the Research Laboratory has made distinct progress towards a solution of its main problem, viz., the relation between fibre properties and spinning value. There are still certain anomalies in the results which require elucidation and work is being concentrated on them.

Nine Bulletins were issued during the year, summaries of which are to be found in the Director's Report.

INDORE INSTITUTE OF PLANT INDUSTRY.

56. The Director's Annual Report will be found in Appendix II.

In 1922, the Committee considered that a Central Agricultural Institute for Cotton Research was essential and in 1923 it was decided to contribute to the proposed Plant Breeding Institute at Indore which was then under consideration and which, in virtue of the large grant from the Committee, would devote itself principally to the investigation of cotton problems. Indore is ideally suited for investigations connected with cotton growing, lying as it does in the largest homogeneous cotton tract in India, in parts of which cotton occupies over 50 per cent. of the cultivated area. The cottons of the Malwa plateau were at one time of excellent quality and staple but they have been largely ousted by the high-yielding, short-staple varieties, though it is still possible to find considerable areas of good spinning cotton. The object of the Institute is to provide a centre of cotton research for the black soil tract of India. The Institute is undertaking a general study of cotton genetics, physiology and agronomy with special reference to the Central India cottons. Considerable progress has been made in all directions, particularly with the agronomy of the crop, and in three years

the outturn of the best plots has nearly doubled, even in a year of poorly distributed rainfall. The cumulative effect of clean fields, of improved grading and surface drainage and of the application of compost to the crop of groundnut preceding cotton is now becoming evident and should result in much heavier crops than have ever been dreamt of by the grower. The methods employed entail no expense beyond the means of the cultivator. No manure is imported and no fertilizers are purchased. The compost is manufactured from waste products only—weeds and cotton stalks, and an easy method of converting the latter into manure between two cotton seasons has been found. A tentative recommendation can even now be made as regards the ideal method of growing cotton on the black soil of Central India, viz., to grow it after groundnut manured in May with compost at the rate of 10 to 20 carts per acre, to apply a dressing of 20 lbs. sulphur per acre in May to flocculate the soil colloids and restore aeration; to inter-cultivate alternate rows with a ridger as soon as the plants are big enough to withstand the disturbance to the land and to complete the ridging about ten days later after the plants have formed their first pair of permanent leaves. Considerable headway has also been made with the improvement and classification of Indian cottons. A number of selections from the local *Malwi* cotton has been made and a few of the most promising types are being grown on a field scale. As soon as sufficient seed is available, a system of seed distribution will be organized. The work of improving the yield and ginning percentage of *Bani* cotton by hybridisation has been taken in hand and it is hoped to produce a cross which will be taken up by the *ryots* to replace the existing inferior cottons. The stages in the work of improving the cotton grown in this area will therefore be (1) to replace the present mixed crop with a pure line of *Malwi* cotton, (2) to replace this pure line at a later date with a *Bani* type of cotton improved as regards yield and ginning outturn by hybridisation with *Malwi* or *Roseum*. In addition to the work of cotton improvement, the Institute is also becoming a centre for the training of young men and cultivators in rural development. The sons of big landowners are coming forward for training and at his own request, H. H. the Maharaja of Indore, accompanied by his tutor, the Rural Development Commissioner and the Subba (Collector) of Indore attended a course of 24 lectures and demonstrations given by the Director on the principles underlying rural development.

GRANTS-IN-AID.

57. The Committee's policy is to give grants-in-aid to Provincial Departments of Agriculture and to Indian States for the purpose of providing staff and equipment to carry out specific investigations approved by the Committee. All schemes are first considered and approved by the Agricultural Research Sub-Committee which is composed mainly of the experts on the Committee. Progress Reports are submitted by the officers in charge every year so that the Committee is kept in close touch with the developments of the work.

The Committee is at present financing thirteen schemes for the betterment of Indian cotton and has sanctioned funds for starting six more. These latter will be commenced during the present financial year and a brief review of their objects is given separately. In addition to providing money for Research Schemes, funds have been allotted for the more rapid extension and distribution of improved varieties of cotton and when results of the Research Schemes are forthcoming the Committee has decided to help in getting them introduced into general practice. These seed extension schemes are also briefly commented on.

The existing schemes are distributed as follows :—

Madras	1—Botanical.
Bombay	5—2 Botanical, 1 Physiological, 1 Mycological and 1 Entomological.
Central Provinces ..	1—Botanical.
United Provinces ..	1—Entomological.
Punjab	2—Botanical and Physiological, and Entomological.
Sind	1—Physiological.
Hyderabad	1—Botanical.
Indore	1—Botanical and General.
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The schemes for which funds have been allotted and which are likely to commence in the current financial year are :—

Madras	2—1 Physiological and 1 Entomological and Physiological.
Bombay	2—1 Extension of existing Entomological Scheme so as to bring into practical use the results of the research; 1 Co-ordination of all the research being financed by the Committee.
Punjab	1—Provision of ginning facilities in extension of present scheme.
Bikanir	1—Botanical.

(*A*) SCHEMES IN PROGRESS.

MADRAS PRESIDENCY.

58. *The Madras Herbaceum Scheme.*—This scheme was started in 1923 with a view to obtain by selection strains of cotton superior in yield

and quality to the local *Uppam*, known botanically as *G. herbaceum*. The problem in this area is a difficult one as the rainfall is light and somewhat precarious. There are 800,000 acres of rain-fed cotton, mainly *Karunganni* and *Uppam*. In good years *Karunganni* is a much better yielder than *Uppam* while in bad years the position is reversed. The cultivator tries to meet the situation by growing either a mixed crop or the two varieties in alternate years. The *Karunganni* strains being distributed by the Agricultural Department are capable of being spun into 26s standard warp counts and the *Uppam* local mixture to 14s only. The intention underlying the scheme is to level up the difference between these two cottons by producing a high-yielding strain of *Uppam* capable of spinning 20s or more to replace the local mixture and thus obviate the growing of mixed crops. The first stage of the scheme was the isolation, in pure lines, of the different strains of *Uppam*. The second stage was the testing of these strains in the field and in the Spinning Laboratory in order to determine whether any of them is better in point of yield and staple than the mixture. Both these stages have been completed and though five improved strains have been obtained, giving as good yields as the mixture, with marked improvement in spinning quality, they cannot compare in either respect with *Karunganni*, and the gap between the two cannot be said to have been closed. The limit of improvement by selection has been reached and if the necessary levelling up is to be done resort must be had to hybridisation. This, the third stage, was sanctioned at the last meeting of the Committee. Work has already been commenced with a cross between *Indicum* and *Cernuum* but the Committee's grant will enable an extensive crossing programme to be carried out, using the improved strains as parents. This work will take several more years to bear fruit, but in the end, it is hoped to obtain a strain yielding as heavily and capable of spinning as high counts as *Karunganni* and being in addition as drought-resistant as the local *Uppam* mixture.

Bombay Presidency.

59. *Surat Physiological Scheme.*—This scheme also commenced in 1923 and was extended in 1928 for a further period of five years as there seems every prospect of results being obtained which will add materially to the profits of the grower. The object of the scheme is to determine the causes of shedding of cotton buds, flowers and bolls and to devise measures to reduce some, at least, of the loss. This shedding is a very serious factor in the growth of the crop, and the prevention of even a small percentage of the loss would be of great economic advantage to the cultivator when it is taken into consideration that, ordinarily, only about 8-10 per cent. of the flowers produced develop into mature bolls. The first few years of the scheme were devoted to investigating suspected causes but some of these were rejected after a brief trial and attention concentrated on others. In this way, fungus attack, lack of fertilisation of the flowers and damage by the Spotted Bollworm were eliminated as being the main cause of shedding. The hypothesis was then formed that the shedding was caused by the interaction between the different parts of the plant for the available elaborated plant food in the

soil, or, in other words, that the plant produces flower buds in excess of its nourishing power and the shedding results from competition between the different parts of the plant for the limited supply of food, mainly nitrogen. The work of the last two years has confirmed this theory and attention is now being paid to the causes of the inadequacy of nitrogen and how this can best be remedied. The application of readily available nitrogen to the plant appears to have three distinct effects. Firstly, it stimulates plant growth, with a resultant increase in the production of flower buds. The second effect is the larger development of buds and thereby their proportional success. The third is that the applied nitrogen prevents the possible fall in the rate of success of flowers into bolls. These effects depend upon the availability and the duration of the supply of nitrogen which are again dependent on the amount of water in the soil and this in a rain-fed crop cannot be controlled to any great extent. In places, however, where the water-supply can be controlled, the late application of nitrogen to the cotton crop should give greatly increased yields. This has been the experience in the Punjab where an increase of four *maunds* an acre has been obtained. This investigation at Surat would appear to supply the reason for the increase in the Punjab. Further work is being directed towards finding the best way of supplying the deficient nitrogen and of maintaining the mobility of the soil moisture.

60. *Surat Entomological Scheme.*—This scheme started in 1923 and was extended in 1928 for two years. It came up for review at the last meeting of the Committee in July when it was decided to finance the application of the results of the research over a large area to see the effect of the measures on the crop. The object of the scheme was to study the life-history of the *Earias* Boll-worms (*Earias fabia* and *insulana*) which do considerable damage to the cotton crop in those parts of India where the Pink Boll-worm is not a serious pest, and to devise means of reducing the loss caused by them. Some very interesting and important facts were discovered with regard to the pest in relation to the cotton crop. By protecting cotton plants from the ravages of the boll-worm, it was found that the crop matured six weeks earlier. The complete extirpation of the pest would mean that the Surat area could grow a much later and heavier-yielding variety. Pupation takes place in the soil and it was found that a shallow mulch prevented the successful emergence of the moth. In field practice, however, it was found difficult to maintain an efficient mulch right up to the stems of the plants and the success of this method is therefore doubtful. The most hopeful measure of success appears to lie in the complete clearing up, immediately after harvest, of all cotton sticks and stubble and the eradication of alternate host plants which harbour the carry-over from season to season. This is the finding of the research workers and the Committee has agreed to finance these operations over an area of about 450 square miles for the next three years. Re-infection by flight is bound to take place at the edges of this area, but it is hoped to obtain in the centre a large tract of country completely free from attack. It will then be possible to assess the damage done from the extra crop obtained by the exclusion of the boll-worm. By caging the plants so as to

exclude the moth, increases as high as 82 per cent. and 54 per cent. in the last two years were obtained under experimental conditions, and though it is not expected that as good results as these will be obtained in the field, the extra yield and improved quality will more than compensate for the trouble and labour involved. If at the end of three years this method is found successful, the Committee will probably recommend to the Bombay Government that the boll-worm should be declared a pest under the Pest Act. In the Madras Presidency where it is in force, the Act requires the growers to remove and destroy all cotton stubble by a certain date each year.

61. *Dharwar Wilt Scheme.*—This scheme commenced in 1923 and was extended in 1928 for a further period of five years to enable the workers to evolve types of cotton resistant to the disease. Wilt is the principal disease of cotton in India and the indigenous varieties grown in the Bombay Karnatak are peculiarly susceptible to its ravages and heavy losses are incurred every year by the growers. The Committee's scheme was intended to investigate the problem with a view to finding means of checking it. Several tentative partial solutions have had to be abandoned and it does not appear that remedial measures are possible. The best solution and the one now being pursued at Dharwar is the evolution of strains immune or resistant to the disease. Considerable success has already been achieved and the Agricultural Department is now distributing the seed of a cross between two previous selections, *Dharwar* 1 and *Dharwar* 2, previously evolved by the cotton breeder, which has proved to be highly wilt-resistant. *Dharwar* 1 is a heavy-yielding cotton susceptible to the disease while *Dharwar* 2 is resistant but a poorer yielder. The cross has all the other good qualities of the susceptible *Dharwar* 1, viz., yield, ginning percentage and spinning quality. The Committee is also financing a scheme for the rapid distribution of the seed of the new variety and it is hoped to cover the whole of this important area with it in a few years. Another promising cross, *Dharwar* 1 x *Wagale*, is being tried and yield-trials will be conducted from the present year to determine whether it is more remunerative to the grower. This cross yields as well as *Jayawant*—the name given to the *Dharwar* 1 x *Dharwar* 2 cross—and has the same resistance to wilt. It has a higher ginning percentage, however, and a better colour and is reported to spin 34s in place of *Jayawant's* 36s.

62. *Khandesh Cotton Breeding Scheme.*—The grant for this scheme was sanctioned in 1926 for five years so that it is of more recent origin than those previously discussed. The money was provided for extra staff to enable a thorough test to be given on replicated and large field trials to some *Bani-Comilla* crosses made by the Agricultural Department in 1908. The Agricultural Department decided to concentrate on one cross, *B* xx 27, first called *Dhulia I* and now known as *Banilla*. This cross gives a similar yield, a higher ginning outturn and produces a better lint than the local N. R. cotton, and last year a premium of from Rs. 22 to Rs. 36 per *khandy* of lint was obtained for it over N. R. The area under the variety has expanded considerably and last year the Agricultural Department arranged

for the sale of 7,000 bales at different centres in Khandesh. The spinning tests, however, have shown a gradually reduced performance, starting at 20s and coming down last season to 13s. This may be due entirely to seasonal variation, however. The variety also appears susceptible to wilt which is not uncommon in the tract. More work will therefore be necessary the cross before the Committee can feel justified in lending its support to extend it over the whole of the Khandesh tract.

63. *The Sind Physiological Scheme* commenced in July 1927 and has thus completed three years. The object is to investigate certain problems connected with the water requirements, sowing dates and the general physiology of the cotton plant under perennial irrigation, in anticipation of the change from inundation to perennial irrigation under the Lloyd Barrage. The chief obstacle in the past to the growing of long-staple cotton in Sind was the precariousness of the water-supply. The provision of an ample and regulated supply of water will alter the whole outlook and will give a chance to the more valuable stapled types of cotton. Experiments already carried out show that the long-stapled exotics fall far behind the more hardy indigenous cottons in yield and the Agricultural Department is concentrating on evolving a hardy and prolific strain of long-staple cotton by selection from and hybridisation with the hardy 4F Punjab variety. In order to be in a position to advise the growers when the canals are opened in June 1932 the Agricultural Department must be in possession of certain facts regarding the best sowing dates and the optimum water requirements of the cotton plant and must also be in possession of a cotton which will give a net income greater than the variety which is at present being grown. The work being carried out now is meant to provide the necessary data. The Committee is providing funds for the physiological work only, while the Bombay Government is holding itself responsible for the botanical and agronomical investigations.

64. *Dharwar Cotton Breeding Scheme on Upland Cotton.*—The scheme was started in 1923 and closed down in 1929. The object was to improve the staple of Upland cotton by crossing it with Sea Island. Dharwar Upland is the only American cotton which has survived the many attempts to introduce exotics into the rain-fed cotton tracts of India. The Department has already replaced the old mixture by a pure type—*Gadag I*—which is largely grown round Gadag. The scheme was meant to improve on *Gadag I*. A strain was obtained, which gave an improved staple and a higher ginning percentage than *Gadag I*, but the spinning tests showed that it was not superior in strength and was inferior in the number of counts to which it could be spun. It was therefore decided to close the scheme down as a research of the Committee and to hand over to the Cotton Breeder, Dharwar, for further work the selection which showed some promise of success.

Central Provinces.

65. *Botanical Scheme.*—This scheme started in 1923 and was extended in 1928 for a further period of five years. The objects are (1) to obtain

higher yielding and better quality cottons, immune to wilt disease, for the Central Provinces and Berar, (2) to study the causes of the low yields of cotton in Berar, (3) physiological work on the cotton plant and (4) the purification by selection of the Chanda cold-season *Bani* cotton, of which about 10,000 bales are produced annually. The work of obtaining pure lines of the various types of Indian cotton had already been taken in hand by the Cotton Botanist, Dr. Youngman, before the Committee made a grant to the Central Provinces Government. The saving in time thus effected has enabled the main part of this scheme to come to fruition before the others. Dr. Youngman decided to concentrate on a strain of *Verum*—No. 262—which was found to be wilt-resistant even on land on which *Roseum* and other varieties failed to grow, and which has a lint far superior in spinning qualities to the local *Oomras*, spinning 20s to 22s against 8s to 12s. An enormous demand has sprung up for the seed and the Agricultural Department hopes to help in the marketing of 40,000 bales in the coming season. Last year the cotton fetched about Rs. 100 on *Oomras* or roughly Rs. 65 on *Broach*. It is an early maturing strain and in certain districts of the Central Provinces and Berar, which receive a prolonged monsoon, it suffers considerably from shedding. The Agricultural Department is now at work on the selection of a late strain suitable for these districts and already there are signs of success. The Central Provinces' Government have realized the importance to the grower of this new variety and for two years have given an advance of Rs. 2 lakhs, free of interest, to the Department of Agriculture to help to market the crop and for the purchase of seed. The Central Cotton Committee also offered a loan of Rs. 2½ lakhs in the coming year towards the marketing of the 40,000 bales so as to prevent mixing and to ensure an adequate supply of pure seed but the Central Provinces' Government made arrangements to supply all the necessary finance. It is anticipated that nearly one million acres will be grown next year in concentrated areas, and when the late maturing strain is evolved, it is hoped to cover the whole of the Central Provinces and Berar with this improved cotton. This will be one of the most revolutionary changes in India's cotton history. To replace the bulk of the chief ingredient of the Indian crop—*Oomras*—spinning from 8s to 12s with a variety spinning 20s to 22s will be no mean achievement. The extra profit to the growers amounts on a conservative estimate to Rs. 10 an acre so that they will benefit to the tune of Rs. 5 crores yearly, quite apart from the crop of large areas saved from wilt which exacts such a heavy toll from the varieties at present being grown. There is every possibility too of this strain being suitable for a considerable portion of the area outside the Central Provinces and Berar which also produces the *Oomras* descriptions of cotton so that it is impossible to overestimate the value of the work.

The other items in the research programme have not been neglected and these investigations are also likely to be crowned with success. The purification of the *Chanda Jari* cold-season *Bani* cotton and the elimination of the undesirable khaki lint have been successful and the seed of a pure white strain is being distributed. The physiological work on the cotton plant is being tackled from the manurial, rotational and water requirement

points of view. The Department of Agriculture is now in a position to recommend to the growers of cotton a three or four-course rotation with groundnut and juar (*Sorghum*) which will add materially to their cotton crop. It has been found that the profitable application of concentrated manures to cotton under dry cultivation depends on the price of cotton and the chief factor in deciding the outturn is undoubtedly the amount and distribution of the rainfall. Experiments are in progress to find out more about the requirements of the plant in this respect and to work out means of checking losses of moisture from the soil.

66. *Mycological Scheme.*—Wilt is responsible for considerable loss in Berar and the *Roseum* variety introduced in the early days of the Agricultural Department is very susceptible to the disease. The rapid increase in the area under groundnut in Berar in recent years is chiefly due to the fact that the grower had to find something to replace his wilted cotton. The Mycologist to the Central Provinces Government, Mr. J. F. Dastur, undertook to work out a physiological aspect of the disease and the Committee sanctioned a grant in 1923 to provide for additional staff and equipment. Mr. Dastur came to the conclusion that the wilted condition of cotton plants was physiological and not pathogenic. The Committee felt that the investigation was not likely to lead to anything of practical value and closed down its grant at the end of 1928.

THE UNITED PROVINCES.

67. This *Entomological Scheme* commenced in 1923, was extended in 1928 for two more years, and at the recent meeting in July was given an extension for one more year. The Pink Boll-worm (*Platyedra gossypiella*) is the worst pest of cotton in India and the damage done by it is enormous. In the northern part of India, the moths are carried over from season to season as *larvæ* in double seeds of cotton and if these *larvæ* could be effectively controlled, the damage done in the succeeding year would be greatly reduced. The purpose of the scheme was to determine the amount of damage done and to discover control measures. The investigation has shown that by excluding the moth, the grower would reap an increased crop of about four *maunds* an acre, and in addition would obtain a much better price for it by reason of its improved quality, due to the absence of stain. It has been estimated that he would benefit to the extent of Rs. 30 an acre. The remedy consists in heating the seed to about 60° C. which is sufficient to kill the *larvæ* but does not affect the viability of the seed. Special machines for heating large quantities of seed are on the market and one of the chief items on the programme was to test the efficacy of one type and to experiment with a safety heating device to ensure that the optimum temperature was maintained for killing the *larvæ* without damaging the germinating capacity of the seed. Small quantities of seed can be adequately treated by exposure to the sun's rays in the months of April and May but where large quantities have to be dealt with, as in ginning factories, this method is impracticable. To ensure the success of the method, it is essential that all cotton seed, whether used

for sowing or for feeding, should be treated as re-infection will take place from any stocks of untreated seed. The work has been highly successful and large scale experiments have confirmed the small experiments carried out in the first years of the investigation. An area of 23,000 acres of cotton was controlled last cotton season in Atrauli Tahsil of Aligarh District and the general opinion of the crop was that it was the best produced in living memory. The intention of the Entomologist to the United Provinces' Government who is in charge of the work, is to heat-treat the seed in the whole of Aligarh District and thus obtain irrefutable evidence of the success and value of the treatment. It is then hoped that all the seed produced in the Province will be treated and so eliminate the pest and the enormous losses incurred by the grower. The method will be applicable to the adjoining cotton-growing districts in the Punjab and probably also to the northern parts of the Central Provinces and neighbouring Indian States. In the United Provinces alone the extra profit to the grower if the Pink Boll-worm were eliminated is estimated at 2½ crores a year and the cost of treatment would amount to about Rs. 1½ lakhs.

PUNJAB.

68. *Botanical Scheme.*—For this scheme the Committee has provided a Cotton Research Botanist and a grant for special staff and equipment for the study of the problems connected with cotton growing in the Punjab Canal Colonies. The Punjab Government has also incurred considerable extra expenditure and a special cotton section has been established. Work started in 1925 on both American and *desi* cottons though attention has been mainly concentrated on the former. As a result of the work of the Agricultural Department, American cotton covers an area of upward of ¾ million acres, but periodic " failures " of the crop both as regards yield and quality made it necessary to undertake an investigation into the cause and to try and obtain a better variety than the one now so extensively grown. These problems are being studied both from the varietal and physiological aspects. Though the work has been in progress for five years only, Mr. Trought, the Botanist in charge, has obtained a strain which has every indication of being a distinct improvement over the present variety both as regards yield and staple, though sufficient tests have not yet been carried out to justify recommendation for extensive cultivation. The selection appears to be able to withstand the conditions which cause the periodic " failure " of the American crop and will, it is confidently hoped, give a large outturn of a more valuable cotton which will ultimately replace the present 4F variety and automatically put a stop to the malpractice of mixing, which has given to the cotton from the Punjab an undesirable reputation. The chief cause for the practice of mixing is the presence in the same area of two staples of approximately the same length, which makes detection very difficult. The new strain has a staple which can be readily identified from *desi* cotton and mixing, it is hoped, will disappear. Pending the distribution of any new strains evolved, roguing of commercial crops on the farms of certain big estates is being carried out on a large scale in order to maintain a nucleus of pure seed for

propagation. A *desi* type (*G. sanguineum*) found has proved to be a better yielder than any of the others and is now being multiplied up for distribution. The investigations into the causes of " failure " of American cotton seem to point to the fact that during its development climatic factors may produce unfavourable reactions in the plant. In some years the effect of certain conditions or the accumulation of a number of unfavourable factors may be sufficiently severe to produce a pathological state which is reflected eventually in the failure of the bolls to open properly, caused by the effect these influences have on root development, particularly in the early stages of the plant's growth. No one climatological factor can be held responsible, but it is the cumulative effect of a number of unfavourable conditions which is liable to produce the " disease." Daily meteorological records are taken and further confirmatory work is in progress. Methods of ameliorating the conditions are being tried though it is probable that the most effective means of avoiding these failures will be to produce a type of plant which is constitutionally fitted to withstand the caprices of the climate and which will produce a properly nourished boll even under the most unfavourable climatic conditions.

69. *Entomological Scheme.*—This scheme has completed four years' work, having commenced in 1926. The object of the investigation is to ascertain the reason for the difference in the incidence of the Pink Boll-worm (*Platyedra gossypiella*) between the South-east Punjab, where it is serious, and the Canal Colonies where up-to-date the damage done has been insignificant. It is most important to know whether the control in the latter areas is a natural one and the investigation has given an answer to this question. It has been definitely proved that temperature is the principal factor in the emergence of the moth and unless the extension of canal irrigation alters the climate of the Punjab, there is little likelihood of the Pink Boll-worm becoming a serious pest in the Canal Colonies. This investigation will prove of great value to all areas in India with climatic conditions similar to those in the Punjab, e.g., Sind, the Punjab States and North Rajputana. It was found that stored cotton seed is the chief source of re-infection while heaps of low grade cotton and *patti* in ginning factories constitute an important source of danger. Exposure of the seed to the heat of the sun for one day during April to June kills all the contained worms. This is a simple and practical method of control for small quantities of seed.

HYDERABAD.

70. *Botanical Scheme.*—This scheme commenced in May 1929 and has thus just completed one year's work. The following programme is being taken in hand:—(1) the botanical study of the mixture of cotton now grown under the name of *Gaorani*, (2) the production of a high ginning, prolific and uniform type of *Gaorani*, (3) study of the development of the cotton plant as grown under the conditions pertaining at Parbhani, (4) preliminary study of the effect of a number of cultural factors on cotton development and yield, (5) preliminary trial of a number of medium or long staple Upland American varieties to determine their suitability as unirrigated crops in the

Gaorani tract and as irrigated crops in areas where canal irrigation is being made available, (6) study of insect pests and diseases of cotton. Hyderabad State is the third largest cotton-growing Province in India and until within recent years had the reputation of producing one of the finest of Indian cottons, viz., *Gaorani* or *Bani* which was much in demand by Indian mills. Owing to the spread of the *Roseum* type of short-staple, high-ginning and high-yielding cotton, this reputation has been largely lost, and the object of this scheme is to obtain a strain of *Gaorani* which will be able to compete financially with the usurper. It is doubtful, however, if this can be achieved as *Bani* is a poor yielder with a very low ginning percentage. If it is found that the premium obtained for a pure strain of *Gaorani* does not pay the grower, the *Verum* type being introduced in the contiguous areas of Berar may prove successful and may ultimately replace the short-stapled *Howri* over a large area. It is the Committee's policy to introduce the cotton which will give the largest monetary return to the grower.

CHAPTER IV.

(*A*) NEW SCHEMES SANCTIONED.

MADRAS.

71. *The Pempheres and Physiological Scheme.*—This was sanctioned in 1925 but has been held up owing to the difficulty of obtaining a Physiological Botanist with the requisite qualifications and experience to take charge of the work. The grant was sanctioned for the provision of staff at Coimbatore for the investigation of three inter-connected problems. The first part of the scheme was to provide for the continuance and development of the physiological work on bud, flower and boll shedding started by Mr. Hilson, and secondly to find out the best means of dealing with the Cotton Stem Weevil Pest (*Pempheres affinis*). The weevil, at first thought to be a minor pest in Madras, has shown signs of being widely spread and of being responsible for considerable loss. Some varieties of cotton appear to be more resistant to attack and show a marked power of recovery, and the object underlying the scheme is to investigate the reasons for their relative immunity and to control the pest by the selection of suitable strains. The scheme at first provided for a Physiological Botanist in charge of the work, with a Bio-chemist and Botanical, Chemical and Entomological Research Assistants. Owing to the difficulty of obtaining the Botanist, a modified scheme has been agreed on and work will be started at an early date.

72. *Scheme for the study of the harmful after-effects of fodder "Cholam" on Cotton.*—In certain parts of Madras Presidency cotton is generally grown after fodder '*cholam*' (*Andropogon sorghum*) or '*cumbu*' (*Pennisetum typhoideum*). It has invariably been found that cotton gives an increased yield of 15 per cent. from fields cropped with '*cumbu*' the previous year, over the fields cropped with fodder '*cholam.*' The object of the investigation is to ascertain the cause of the difference and to suggest methods to eliminate or at least ameliorate the harmful after-effects of '*cholam.*' It does not appear to be a manurial problem as similar results were obtained at Koilpatti Agricultural Research Station from heavily manured land. A study of the moisture and nitrogen movement in the soil cropped with these crops is expected to throw considerable light on the phenomenon. A small grant has been sanctioned by the Committee for three years and work will be started in the coming season.

BOMBAY.

73. *Extension of the Surat Entomological Scheme.*—This has already been dealt with under the original scheme, but the extension is included here as a new scheme as it illustrates the principle adopted by the Committee that financial help will not be withheld when a piece of research work has

been brought to a successful conclusion but the Committee will aid Agricultural Departments in bringing the results to the knowledge of the grower. The Surat Entomological Scheme as a piece of research will now close down, the investigators having come to the conclusion that the most effective way of controlling the *Earias* Boll-worms being to make a general clean-up of all cotton sticks and stubble and alternative host plants which harbour the *larvæ* between one cotton-growing season and another. The intention is to carry out intensive propaganda over a wide area of 450 sq. miles in which all cultivators will be induced to adopt the clean-up measures recommended. The effect on the crop of this area will be carefully watched and it will be possible to arrive at some conclusions of the damage done by the Boll-worm to the cotton crop. The scheme has been sanctioned for three years, at the end of which period it will be reviewed by the Committee.

74. *Co-ordination of Cotton Research in Bombay Presidency.*—Bombay is the largest cotton-producing Province in India, having an average of nearly 29 per cent. of the Indian crop. By reason of its importance and the diversity of its cottons, the Committee has financed more schemes in the Presidency than in other Provinces. Each of these schemes is in charge of specialists lent by the Agricultural Department, but as the Bombay Government has no Economic Botanist specializing in cotton to supervise and co-ordinate all the work, the Committee decided to recruit an experienced officer, who would be taken in the *cadre* of the Agricultural Department at the end of five years, and who would take charge of all the work on cotton in the Presidency. Difficulty is being experienced in obtaining an officer with the necessary qualifications and experience on the remuneration offered but it is hoped to fill the post at no distant date.

Punjab.

75. *Provision of ginning facilities at Lyallpur.*—This new scheme entails capital expenditure only and is part and parcel of the Punjab Research Scheme started in 1925. As a result of the work at Lyallpur, there are 29 different types of cotton being grown by the Cotton Research Botanist on an area of 70 acres. Elaborate precautions have to be taken through all the agricultural operations to prevent mixture, and the workers have to be particularly careful in the ginning of the different plots as it is at this stage that most danger of admixture is likely to occur. No commercial firm will undertake to carry out the numerous and careful cleaning of the gins necessary to ensure perfect freedom from contamination and the produce of the small plots must be ginned on a small-scale ginning plant under strict control. At the last meeting the Committee sanctioned the erection of a small experimental ginnery at a cost of Rs. 18,125 which will be taken over at an agreed price by the Punjab Government at the conclusion of the work.

Bikaner.

76. *Scheme for Cotton work on the new Gang Canal.*—This small scheme entailing capital and recurring expenditure of just over half a lakh over a

period of five years was sanctioned in July for the purpose of carrying out the following programme of work on cotton at the experimental farm at Ganganagar in Bikaner State :—(1) The isolation by means of selection and hybridisation of improved types of Indian and American cotton capable of spinning at least 25 counts. (2) The production, maintenance, and supply of pure seed of improved types for distribution in the colony. (3) The improvement of the production of raw cotton including cultivation, manuring and the correct adjustment of irrigation water. (4) The discovery of the best rotation for cotton, including the effect on yield and staple of periodical monsoon fallows. The extension of the Gang Canal into the Bikaner State opens up a big tract of country capable of giving prolific crops of good quality cotton, and it is expected that ultimately the area under command will produce 250,000 bales a year. Experiments already carried out would seem to indicate that *desi* cotton is much more profitable than the Punjab-American type, but it is still too early to make a definite decision. The Bikaner Durbar has already taken steps to license gins and presses so that an effective control over the produce of the State will be maintained and the abuses and malpractices found in British India will be kept in check.

(*B*) SEED EXTENSION SCHEMES.

77. The following resolutions passed at the 1929 Monsoon Meeting of the Committee define the intention underlying this new aspect of the Committee's undertakings :—

(1) " That in view of the extreme importance of the supply of seed of established improved varieties of cotton being made readily and cheaply available to the cultivators, the Central Cotton Committee invite Local Governments and Directors of Agriculture to submit proposals based on local requirements, whereby the Committee can assist, by the provision of staff or funds—or in any other way—in the wider distribution of the seed of improved varieties of cotton to the cultivators."

(2) " That the Central Cotton Committee feel most strongly that the practical value of any successful research accomplished as a result of schemes financed from the Committee's grants depends entirely on these results being widely broadcast and subsequently incorporated in general agricultural practice. The Committee therefore consider that, as soon as any of the Committee's research schemes produce results which constitute a definite advance to cotton growing for any particular area or tract, the Committee should take steps to discuss, in consultation with the Provincial Cotton Committee, Divisional Cotton Committee or Durbar and the local authority directly responsible for agricultural development, the best methods of extending these results in practice and, in particular, what practical assistance would be most welcomed from the Committee for the work in question."

78. Directors of Agriculture were asked to submit schemes for help in the distribution of the seeds of existing improved varieties of cotton and the following are now in operation :—

Madras.—An irrecoverable grant of Rs. 18,000 over a period of five years was sanctioned for the extension and distribution of the seed of improved *Cambodia* cotton. The Committee is providing the pay of a man to act as grader, adviser and business manager to a group of seed societies in the Coimbatore District which are growing selected strains of *Cambodia* cotton, ginning and selling the lint collectively and assisting the Agricultural Department in the distribution and extension of the improved seed.

Bombay Presidency.—Subsidies of Rs. 40,800 and Rs. 44,875 over a period of five years were sanctioned to the Hubli and the Gadag Cotton Sale Societies, Ltd., in the Dharwar District for the extension and distribution of the seed of the improved *Jayawant* and *Gadag* 1 cottons respectively. These amounts are being utilized for the provision of staff to carry out roguing in reserved seed-growing areas, to arrange and supervise separate ginning and stocking of pure seed and to meet overhead charges for cleaning, bagging, transport, godown rent and insurance. At a later date the Committee also agreed to meet the interest charges up to a maximum of 5 per cent. on the loans taken by these Societies from the Co-operative Central Bank for financing their operations of laying in stocks of seed.

Irrecoverable grants of Rs. 27,752 under the Haveri Scheme, Rs. 27,425 under the Bailhongal Scheme and Rs. 39,482 under the Athani Scheme were also sanctioned over a period of five years for the multiplication and distribution of seed of *Jayawant* and *Dharwar* 1 cottons in the parts of the Dharwar District untouched by the Hubli Scheme mentioned above, for the extension of the improved variety, *viz., Dharwar* 1 x *Rosea* in Bailhongal and for the spread of *Jayawant* in the Athani Taluka of Belgaum District.

The Committee also approved of grants of Rs. 4,000 to provide for a graduate Assistant and Rs. 10,000 for seed depots over a period of two years for the extension and distribution of the improved 1027 *A. L. F.* in the Surat tract of Gujerat. The Assistant's work is to organize new seed depots at fourteen centres.

Hyderabad State.—Rs. 5,000 a year for three years have been sanctioned as an irrecoverable grant for the provision of temporary staff required for the extension of *Gadag* 1 and *Dharwar* 1 seed in the Raichur and Gulbarga Districts of Hyderabad State.

Central Provinces and Berar.—A non-recoverable grant of Rs. 16,300 for one year for additional staff to supervise the roguing, collection, ginning and marketing of *Verum* 262 was sanctioned by the Committee. In addition a temporary loan of Rs. 5,000 at 5 per cent. interest for alteration to godowns at various centres in the Central Provinces and Berar to bring

them up to the requirements of the Imperial Bank of India, and the offer of a loan of Rs. 2½ lakhs for six months at 5 per cent. interest to aid in marketing the crop of *Verum* grown under Departmental supervision so as to prevent mixing and in order to secure an adequate supply of pure seed have also been sanctioned.

In his opening address at the twenty-first session on the 30th June 1930, the President said he considered the decision of the Committee to finance the extension of improved varieties of cotton in the Provinces was one of its most important contributions to the improvement of cotton in India. With this statement no one will disagree and it is gratifying to see how well the Provinces have responded to the invitation to put forward schemes. Nearly one-third of the total Indian crop is now improved stapled cotton—the result of the early work of the Agricultural Departments—and this proportion will increase every year. There is likely to be a big spurt in the next few years with the expansion of the area under *Verum* in the Central Provinces and Berar and as a result of these seed extension schemes. As time goes on, the whole character of the Indian crop will be changed, for the Committee and the Agricultural Departments are working on the principal cottons of the country and the unimproved varieties now being grown will be replaced by others giving a better return to the grower and improved performance in the mill.

RESEARCH STUDENTS.

79. The Committee has trained up a corps of scientific workers in all branches of the crop by awarding research scholarships to distinguished students of science from Indian Universities. The recipients are placed under the guidance of experienced investigators working on the Committee's schemes or at the Institute of Plant Industry in Indore. The scholarships are usually held for a period of two years but extensions are frequently given. Forty-two students have been awarded scholarships, of whom six are still under training. Four resigned before completing their training and 24 have been taken on the Committee's staff or have joined Provincial and State Agricultural Departments. Rs. 1,78,546 have been spent under this head in the seven years ending 31st August 1930.

During the year under report, no studentships were awarded. The next selection will take place in December. Two scholars completed their training during the year. One has replaced an officer lent to the Committee by the Bombay Government for the Dharwar Wilt Scheme and the other has been appointed to a temporary post at the Technological Laboratory.

J. H. RITCHIE,

Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1929-30.

I. INTRODUCTION.

As this is the last Annual Report from the hand of the present writer, it is opportune to review the progress that has been made since the building of the Laboratories was begun some seven years ago.

The Technological Laboratory arose out of the enquiries of the Indian Cotton Committee, which, in its report of 1919, recommended the formation of the Indian Central Cotton Committee, which should include on its staff a Cotton Technologist to carry out laboratory tests on Indian cottons for Agricultural Departments, secure authoritative valuations, arrange for and interpret spinning trials, and also carry out general scientific work on Indian cotton fibres. After its incorporation in 1923, the Indian Central Cotton Committee decided to erect a Technological Laboratory in which spinning tests could be carried out under its own control.

The work of the Technological Laboratory falls in two main divisions: firstly, the undertaking of spinning tests; and secondly, the measurement of the fibre-properties of the cottons which are subjected to the spinning tests, with the object of ascertaining, if possible, the connection between such fibre-properties and the spinning value of the cotton. The following brief account explains this two-fold activity of the Technological Laboratory.

The ultimate reasons which led to the establishment of the Technological Laboratory were the difficulties which cotton breeders in India experienced in getting definite valuations of their new types. As cotton is grown to meet the demands of the spinners, it follows that the final judgment on a cotton must be based on the quality of yarn that can be spun from it. The cotton breeder needs a judgment as to the quality of his new types at the earliest possible stage in their life-history. The Technological Laboratory meets this need by carrying out spinning tests on comparatively small samples of cotton. The Spinning Laboratory of the Technological Laboratory has been fully equipped to carry out this primary function. It possesses two ring frames (48 spindles each), and a mule (194 spindles), together with all the preparation machinery needed for these spinning machines. In addition it is equipped with a Nasmith combing set of the most recent pattern for special work. A feature of the Laboratory is the very complete range of testing instruments for examining the characters of the raw cotton used and the yarn produced.

Obviously, the spinning value of a cotton must depend upon the physical and chemical characteristics of the fibre; the problem is to find which are the characteristics that matter, and to what extent. If this problem could be solved it would be a tremendous help to the cotton breeder, especially if by making measurements of a few fibre-properties he could himself obtain a good idea of the spinning values of his cottons. It is these considerations which underlie the second branch of the activities of the Technological Laboratory. All cottons subjected to spinning tests are also subjected to numerous fibre measurements, so that information is being collected which will, it is hoped, eventually make it possible to solve the fundamental problem of the Laboratory and correlate the properties of the cotton fibres with the results of the spinning tests.

Such have been the main problems of the Technological Laboratory from the beginning. The writer took up his appointment as Director in January 1924; at this time the building of the Spinning Laboratory had been begun, and a temporary laboratory for research work had been arranged for in the near-by Victoria Jubilee Technical Institute. A Spinning Master was appointed shortly afterwards; the building was completed in March,—the spinning machinery and electrical equipment were delivered and erected, the supply services were completed, and early in August 1924 the first spinning tests were made on the new plant. In the meantime, at the first meeting of the Technological Research Sub-Committee, held in March 1924, the Director had presented a "Suggested Scheme of Technological Research, with staff requirements for giving effect to the scheme." An outline was given of requirements for spinning tests, and for an investigation of the correlation between fibre-properties and spinning value. The scheme was generally approved, and as a consequence two yarn-testing assistants were appointed, and also a statistician to analyse the results of the yarn tests. Other appointments were of a microscopist, a chemist, and a physics research student. Of these assistants, only the chemist had had any previous experience of cotton, so that much of the first year was taken up by the work of organization and in the training of assistants in the methods of fibre investigation and yarn testing. Moreover, the possibility of the introduction of the boll-weevil into India had become a matter of grave concern, and the problem was handed over to the Laboratory of finding a suitable practical method for the fumigation of all American cotton imported into India, the conditions of fumigation to be such that any live boll-weevils near the surface of the cotton bale should be killed with certainty. The solution of this problem, and the large amount of experimental work it involved, took much of the Director's time in 1924, and all the time of the chemist during 1924 and 1925. The outcome was the issue of a notification by the Government of India requiring all American cotton imported into India on or after December 1st, 1925, to be imported through the port of Bombay, and there to be fumigated in a prescribed manner. Detailed instructions for the fumigation were prepared at the Laboratory, based on the results of the various investigations; indeed, the practical fumigation was actually superintended at

first by members of the staff of the Laboratory, and afterwards by supervisors who are attached to the staff of the Laboratory for work there during slack periods in fumigation work. From the date the notification came into effect until the end of the year under review, no less than 421,607 bales of American cotton have been thus fumigated.

At the very outset the desirability was realized of having certain standards of quality, and after some consideration it was decided to adopt as standards those more or less recent Agricultural Department selections which had passed into extended cultivation, in preference to the better known but more variable commercial types of Indian cottons. Arrangements were accordingly made immediately to obtain a bale of each of these cottons of the 1923-24 crop. The first bulletin dealing with tests on some of these standard cottons was published in April 1925, and contained also a short account of the method of conducting a spinning test at the Technological Laboratory.

As the Laboratory began to fulfil the functions for which it had been instituted, it became increasingly evident that more staff would be necessary to cope with the large amount of testing work which arose from the numerous demands for spinning tests. A very detailed memorandum was presented to the Committee at its meeting in February 1925, on the organization necessary for carrying out with maximum efficiency the spinning tests and the accessory tests. The necessity for co-ordinating the work of the testing room with that of the spinning room was discussed, and the number of staff indicated which was needed to make effective the scheme propounded. It was felt at the time that, for testing work of this kind, non-graduate assistants might be appointed who would be able, under proper supervision, to carry out the testing work satisfactorily. The experiment was accordingly tried a little later, when some additions were made to the testing staff, and it proved to be quite successful. By the middle of 1925 the spinning tests were in full swing, and by August 31st of that year spinning tests had been made on 54 samples of cotton.

The policy followed at the beginning was to concentrate on the spinning tests. Early in 1924 requests had been received for such tests from the Agricultural Departments, and in view of the reasons for instituting the Technological Laboratory it was felt that no better service could be rendered than by making such tests for the Departments at the earliest possible moment. Moreover, full facilities and the staff necessary for the prosecution of the scientific investigation of the cotton-fibre were not available at the beginning. On the one hand, the staff had first to be trained; and on the other, the plans had to be prepared for a research laboratory, and the building erected and equipped. The foundation-stone of the new Research Laboratory was laid on December 3rd, 1924, by His Excellency the Viceroy, the Earl of Reading, who on the same day formally opened the Spinning Laboratory. The transfer of the staff and equipment from the temporary laboratory to the new Research Laboratory took place in September 1925. Further additions to the staff had been made in the meantime, and the new members received their training from the now skilled old staff.

At the end of 1925 another detailed memorandum was prepared outlining the plan it was proposed to follow in attacking the main problem of the Research Laboratory, viz., the relation between spinning value and the fibre-characters of a cotton. This programme was approved at the subsequent meeting of the Committee, so that by the end of the second year of its existence the infant laboratory was fully launched on its career.

Since 1925 there has been a continuous expansion of the work of the Laboratory along the lines indicated in the two memoranda dealing with the spinning tests and the research work respectively. This expansion is perhaps best illustrated by the figures showing the increase in the technical staff, and the work accomplished year by year since the foundation of the Laboratory :—

Increase in Staff, 1924-30.

As at August 31st in :	1924	1925	1926	1927	1928	1929	1930
Technical staff	8	11	20	24	27	27	32
Research students ..	1	3	6	4	3	2	1
Fumigation supervisors..	..	..	2	4	2	2	2
Totals ..	9	14	28	32	32	31	35

The increase in the work done will be clear from the details given in the next section dealing with the Spinning Laboratory.

II. SPINNING LABORATORY.

The increase in the work of the Laboratory is shown by the distribution of the samples spun year by year, particulars of which are given in the following tables :—

Distribution of Samples Spun, 1924-30.

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	Totals 1924-30
Bombay	18	26	22	22	28	66	182
Punjab	14	1	..	..	42	30	87
United Provinces ..	7	..	6	11	9	7	40
Madras	2	19	50	23	30	51	175
Central Provinces ..	2	..	3	2	2	5	14
Miscellaneous	3	11	..	6	6	27	53
Totals ..	46	57	81	64	117	186	551
Standard cotton tests ..	8	54	49	64	33	34	242
Trade tests	..	..	..	..	..	37	37
Total tests ..	54	111	130	128	150	257	830

Distribution of Lots Spun, 1924-30.

Provinces.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	Totals 1924-30
Bombay	36	52	44	44	53	107	336
Punjab	26	4	..	..	83	41	154
United Provinces ..	14	..	12	22	18	14	80
Madras	4	38	100	46	60	85	333
Central Provinces ..	3	..	6	4	4	10	27
Miscellaneous	3	22	..	12	9	33	79
Totals ..	86	116	162	128	227	290	1,009
Standard cotton tests ..	34	176	142	178	68	64	662
Trade tests	..	..	..	..	..	37	37
Total tests ..	120	292	304	306	295	391	1,708

Distribution of Yarns Spun, 1924-30.

Provinces.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	Totals 1924-30
Bombay	103	152	132	132	159	322	1,000
Punjab	106	14	..	..	254	113	487
United Provinces ..	27	..	36	66	54	42	225
Madras	12	108	278	138	180	255	971
Central Provinces ..	8	..	18	12	12	30	80
Miscellaneous	3	58	..	36	27	99	223
Totals ..	259	332	464	384	686	861	2,986
Standard cotton tests ..	95	514	423	447	290	223	1,992
Trade tests	..	..	..	..	..	80	80
Total tests ..	354	846	887	831	976	1,164	5,058

Number of tests.—The extent of the work done in the yarn-testing section will be evident when it is remembered that as a general rule, 50 lea tests, 100 single-thread tests, and 100 twist tests, are made on each type of

yarn spun from a non-standard cotton, and 50 lea tests, 200 single-thread tests, and 100 to 200 twist tests, are made on each type of yarn spun from a standard cotton ; it follows therefore that the testing of the yarns spun in 1924-25 necessitated about 170,000 yarn tests, and since then the number has considerably increased, and during the past year it has reached nearly half a million.

Tests for Agricultural Departments.—Perhaps the most striking feature of the tables on pages 48 and 49 is the very large increase in the number of samples spun during the past year ; the increase over the previous year's figure—which itself constituted a record—is no less than 71 per cent. Special arrangements had to be made both in spinning and in testing to cope with this unprecedented demand for spinning tests. In many cases the samples were spun in single lots, and this accounts for the fact that the increase in the number of lots spun is only 32 per cent. over the number of the previous year. The increase in the number of samples is largely due to the fact that many of the Committee's agricultural schemes have now reached the point where the result of the spinning test becomes an important factor in their further progress. The following table shows the increase in the number of test-reports issued during the period of years, 1924-30 :—

	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30
Spinning Test Reports ..	7	19	19	22	21	63
Fibre Test Reports.	1	1	5	1	7	4
Yarn Test Reports.	..	..	..	1	4	4
Totals ..	8	20	24	24	32	71

The reports referred to above have not been made public, but have been submitted only to the Agricultural Officers and Departments supplying the samples. It is gratifying to know that these reports have proved of considerable value to the Agricultural Departments in deciding their policy concerning the types of cotton to select for multiplication and general distribution.

The following is a statement of cottons tested for the various Agricultural Officers :—

BOMBAY.

(1) *Superintendent, Agricultural Station, Jalgaon.*—Five samples : saw-ginned and roller-ginned Neglectum Roseum, and Banilla tested on three different occasions.

(2) *Cotton Breeder, Dhulia.*—Three samples, of which one was Banilla.

(3) *District Agricultural Officer, Shahada.*—Three samples, of which one was pure Banilla and one a hybrid.

(4) *Superintendent, Baramati Farm, Baramati.*—Two samples, of which one was Banilla cotton grown at Baramati Farm and the other a local control.

(5) *Agricultural Overseer, Chalisgaon.*—One sample of Banilla cotton.

(6) *Cotton Assistant, Pachora.*—Two samples of Banilla.

(7) *District Cotton Overseer, Amalner.*—Seven samples, four of "Localized Banilla" and three of "First Class Banilla" for comparative tests.

(8) *Cotton Breeder, North Gujerat, Viramgam.*—Five samples of Wagad cottons.

(9) *Cotton Breeder, South Gujerat, Surat.*—Eight samples, four Surat and four Broach cottons.

(10) *Superintendent, Agricultural Station, Surat.*—Two samples for comparison with 1027 A.L.F. (Standard).

(11) *The Cotton Assistant, Surat.*—Two samples from Athwa and Sonsek respectively.

(12) *The Cotton Physiologist, Surat.*—Five samples, four being selections from 1027 A.L.F. 1^4.

(13) *Cotton Entomologist, Surat.*—Two samples of 1027 A.L.F. (A and B) grown in Surat Farm for the study of environmental differences.

(14) *Botanist in Sind, Sakrand.*—Ten samples of different strains grown at the Agricultural Research Station, Sakrand.

(15) *Cotton Breeder, S.M.C., Dharwar.*—Eight samples, six being selections and crosses, tested against the local cotton.

(16) *Cotton Superintendent, S.M.C., Dharwar.*—One sample of cross between Dharwar 1 and Neglectum Roseum.

PUNJAB.

(1) *Cotton Research Botanist, Lyallpur.*—Thirty samples for *desi* varietal tests, American varietal tests, American varietal propagation ; and mixtures of *desi* and American cottons.

UNITED PROVINCES.

(1) *Assistant Economic Botanist, U. P., Cawnpore.*—Seven samples, comprising two pure types for comparison with the local Cawnpore cotton.

MADRAS.

(1) *Assistant Cotton Specialist, Koilpatti.*—Six samples, being pure selections from Karunganni and Uppam mixtures, for comparative trials.

(2) *Cotton Specialist, Coimbatore.*—Twenty-four samples, crosses between *indicum* and *roseum*, and samples of Cambodia Co. 2 for time-of-sowing and manurial experiments.

(3) *Agricultural Demonstrator, Tirupur.*—One sample of Cambodia Co. 2.

(4) *Superintendent, Agricultural Research Station, Koilpatti.*—Seventeen samples for variety trials and manurial tests.

(5) *Assistant to the Cotton Specialist, Nandyal.*—Three samples.

CENTRAL PROVINCES.

(1) *Director of Agriculture, C. P., Nagpur.*—Two samples of *Verum* cotton.

(2) *Economic Botanist, C. P., Nagpur.*—One sample of Bani 306.

(3) *Superintendent, Experimental Farm, Akola.*—Two samples: Verum 262 and Verum 264 for comparative tests.

MISCELLANEOUS.

(1) *Agricultural Officer, Port Blair.*—One sample of Sea Island cotton grown in the Andaman Islands from seed supplied by the Secretary, Indian Central Cotton Committee, Bombay.

(2) *Director of Agriculture, Peradeniya, Ceylon.*—Six samples for the study of environmental differences and for determining whether any damage has been caused to the lint in ginning.

(3) *Director of Plant Industry, Indore.*—Two samples of Cambodia cotton grown at the Indore Farm.

(4) *Agricultural Department, Gwalior State, Gwalior.*—Five samples of different strains for comparative tests.

(5) *Assistant Botanist, Government Experimental Farm, Hiriyur.*—Six samples of Mysore-American and Selection 69.

(6) *Agricultural Inspector, Devanagere.*—Two samples, Selection 69 and a local sample.

(7) *Deputy Director of Agriculture, Shimoga.*—One sample of Mysore-American IV (Banavar).

(8) *Cotton Research Botanist, H.E.H. the Nizam's Dominions, Parbhani.*—Four samples for comparative tests.

The standard Indian cottons.—The following is a list of standard cottons referred to in the tables on pages 48–49 ; the figures in brackets after the name of each cotton show the season for which the cotton was first tested as a standard :—

Bombay Standard Cottons.

1. Dharwar 1 (Kumpta) (1923-24).
2. Jayawant (Kumpta) (1929).
3. Gadag 1 (Dharwar-American) (1923-24).
4. Surat 1027 A.L.F. (1923-24).
5. Wagad 8 (1925-26).

Punjab Standard Cottons.

6. Punjab-American 4F (1924-25).
7. Punjab-American 285F (1923-24).
8. Punjab-American 289F (1924-25).
9. Mollisoni (Punjab *desi*) (1925-26).

United Provinces Standard Cottons.

10. Aligarh A. 19 (1924-25).
11. Cawnpore K. 22 (1924-25).
12. Bundelkhand J. N. 1 (1924-25).
13. Cawnpore-American C. A. 9 (1924-25).

Central Provinces Standard Cotton.

14. Verum 262 (1926-27).

Hyderabad Standard Cotton.

15. Umri Bani (1924-25).

Madras Standard Cottons.

16. Coimbatore Co. 1 (Cambodia 295) (1923-24).
17. Coimbatore Co. 2 (Cambodia 440) (1924-25).
18. Nandyal 14 (Sircar 14) (1923-24).
19. Hagari 1 (1924-25).
20. Hagari 25 (Sircar 25) (1923-24).
21. Karunganni C7 (1924-25).

American Cottons.

22. Mississippi (1923-24).
23. Memphis (1925-26).
24. Texas (1923-24).

As previously mentioned, these standard Indian cottons are the Agricultural Department selections which have been introduced into cultivation on a commercial scale. The work on these standard cottons is of importance from several points of view. In the first place, it furnishes the necessary standards by which to judge new cottons; secondly, it provides Agricultural Departments not only with information which they did not previously possess of the capacities of the cottons but also with annual test-results showing to what extent quality has varied from that of previous seasons; thirdly, it provides the cotton trade with very valuable information which has a definite bearing on the marketing values of these cottons. Furthermore, through the combined work in the Spinning and Research Laboratories, the results of spinning tests and fibre measurements are being accumulated for various cottons, and it is by the investigation of these results that it is hoped to solve the problem of their interrelationship.

The latest edition of "Technological Reports on Standard Indian Cottons" includes the results of the tests on the standard cottons of the seven seasons 1923-30. As in former editions, Agricultural Details, Grader's Reports, Fibre Particulars, Spinning Tests Reports, and Remarks are given for each of the twenty-one standard Indian cottons. The most important new feature is the inclusion of the results for a new standard cotton, viz., *Jayawant*, the distribution of which has just begun. *Jayawant* is a Kumpta cotton which has the valuable property of being highly resistant to wilt, which normally takes a heavy toll of the cotton in the Kumpta area of the Bombay Presidency. Except in its resistance to wilt, *Jayawant* closely resembles the other Kumpta cotton, *Dharwar* 1, which it is intended to displace; *Jayawant* has actually been derived by crossing *Dharwar* 1 with *Dharwar* 2, another pure line selection of Kumpta.

One of the Dholleras cottons of Bombay, viz., *Wagad* 4, has ceased to figure among the standards. *Wagad* 4 has invariably given a better spinning

performance than *Wagad* 8, but tests over a number of seasons have shown it to possess the fatal defect of being a comparatively poor yielder, and its distribution has therefore been discontinued.

Blow-room tests.—During the year under review the tests have been completed on the blow-room losses sustained by the standard commercial cottons, kindly supplied by the East India Cotton Association. Each bale was tested in four lots, three being of 100 lbs. each, the remaining part of the bale forming the fourth lot. In many cases the differences in the losses of the four lots did not amount to more than 10 per cent. of the actual loss, but in one or two cases the differences were very much greater than this, showing the existence of unevenness throughout the bale. The following figures show the average blow-room losses of the various grades of the different varieties of the 1927-28 season.

Cotton.	Grade.	Blow-room loss (%)
Oomras C. P. No. 1	Fine	5.20
,, ,, ,, ...	Superfine ..	4.09
Punjab-American	Fully Good ..	11.30
,, ,, ...	Fine	8.95
Bengals U. P.	Fully Good ..	9.40
,, ,, ...	Fine	8.65
,, ,, ...	Superfine ..	7.01
Rajpipla	Fully Good ..	9.11
,, ...	Fine	7.66
Hubli Coompta	Fully Good ..	14.23
,, ,, ...	Fine	14.45*
Upland Gadag	Fully Good ..	18.32*
,, ,, ...	Strict Fine ..	16.01*
Karunganni	Fully Good ..	8.39
,, ...	Fine	6.17

High draft.—During the year under review tests have been made on the Casablancas and Ingoldstadt systems of high draft spinning compared

* It may be noted that these values are in excess of normal trade experience.

with the ordinary system. The different systems have been compared in relation to the spinning of mixings of Indian and American cottons, and a Technological Bulletin has been issued on these tests. A summary of this bulletin is given on page 62 under the heading "Publications." The two types of cottons used in these tests differed considerably in fibre-length, but hardly at all in fineness (fibre-weight per inch), so a new series of tests has now been arranged for on the same lines using Cambodia and C. P. cottons, which differ widely in fibre-weight per inch as well as in fibre-length. Arrangements have recently been made for the installation of other high-draft systems, viz., Tweedales and Smalley's 4-line roller system, which has now actually been erected, and a Platt's frame having the C.S.L. system on one side and their 3-line system of high draft spinning on the other.

Limit-spinning tests.—Some misunderstanding has occasionally been caused by the references in the reports on the standard cottons, to the highest standard warp counts for which any given cotton is suitable, although it is clearly pointed out in "Technological Reports on Standard Indian Cottons," that the count in question is simply the highest count at which the cotton can be spun, with a definite twist factor, to yield yarn of a certain strength. When the standards were originally adopted it was pointed out that these were merely tentative, and it has always been intended to investigate the possibilities of the standard cottons in much higher counts than those at which they are normally spun at the Laboratory. Two cottons have now been investigated to this end, viz., Cambodia Co. 1 and Mollisoni; although the Cambodia, according to the scale adopted, is adjudged suitable for warp counts up to 36's, it has actually been found possible to spin it to as high as 70's counts from single roving. However, too many yarn breakages occurred in the ring frame to permit of economical spinning of 70's counts, and the highest economic limit has been found to be 52's with the twist-constant 4 (28.89 turns per inch), and 56's with the twist-constant 4½ (31.47 turns per inch). Mollisoni is a cotton at the other end of the scale and has been spun in counts up to 16's with twist-constants ranging from 4–5. Large numbers of breakages occurred, however, at counts above 12's, and even in the spinning of 8–12's counts it was only with the twist-constants of 4½ and upwards that the number of breakages was reduced to an economic limit. It is hoped to publish at an early date a bulletin on the results of these cottons. Four other cottons to be included in this series are Surat 1027 A.L.F., Punjab-American 289F, Bundelkhand J.N. 1, and Hagari 1. The six cottons comprising the whole series cover a wide range of spinning qualities as well as of district of growth and botanical species.

New cottons.—Reference has already been made to the isolation of *Jayawant* cotton for the Dharwar tract. Another cotton which has been developed recently is *Banilla* cotton, on which a technological bulletin has been published during the past year. A summary of this bulletin is given in Section IV, Publications. Unfortunately, however, *Banilla* has shown itself to be a bad wilt-resister during the past season, and an effort has now to be made to isolate a wilt-resistant strain.

Trade tests.—The Central Cotton Committee was formed "for the improvement and development of the growing, marketing, and manufacture of cotton in India." Assistance towards the improvement and development of manufacture of cotton in India might naturally be expected to find a place in the activities of the Technological Laboratory. At present there is no institution which performs the same function for the Indian cotton industry that the Manchester Chamber of Commerce Testing House does for that of Lancashire. Conditioning Houses exist in different parts of the world and undoubtedly they give a very useful service, to judge by the use made of them. Thus in 1929 the Manchester Testing House made tests on 3,650 samples of yarn and 17,573 samples of textiles, the total number of samples tested having increased nearly ten-fold since its inception in 1900. There can hardly be any doubt that sooner or later such an institution will be founded in Bombay to provide the same facilities for the cotton industry here, and in view of the experience of cotton problems acquired at the Laboratory this would seem to be ultimately a legitimate extension of its work. Moreover, there is no doubt that the Laboratory could also be developed with a view to investigating problems of sizing, weaving, bleaching, and dyeing. All these matters, however, are for the future. So far the work of the Laboratory has been almost solely concerned with the problem of the determination of the quality of cotton in respect to its spinning properties, as the introduction of new and superior varieties of cotton is a benefit to all sections of the industry from growing to manufacturing, and therefore to the whole country.

At the meeting of the Committee held in July 1929, the Central Cotton Committee passed a resolution requesting the Technological Research Sub-Committee to consider most carefully at the earliest opportunity the means whereby the Committee's Technological Laboratory could be made of more practical use to the cotton trade without in any way reducing the present value of the Laboratory to the Cotton Breeders and to Provincial Agricultural Departments. As a first step in this direction, an arrangement was subsequently arrived at by which the Technological Laboratory now undertakes certain spinning tests for the East India Cotton Association and for the Millowners' Associations of Bombay and Ahmedabad. In all, 29 samples representing the average commercial crop have accordingly been supplied by the East India Cotton Association after inspection and approval by their Standards Committee. The results of the spinning tests on these samples have been incorporated in a number of Technological Circulars (Nos. 23 to 34) which have been published on these cottons, details of which are given in the list of publications (Section IV).

It was originally suggested that co-operation with the Millowners' Associations should take the form of testing a number of mixings to be specified by the Millowners. After further consideration the suggestion has been modified, and arrangements have accordingly been made for the

Millowners to send to the Laboratory samples of the first arrivals of the following cottons :—

1. Bengals.
2. Khandesh.
3. Central India (Ujjain).
4. Mogalai.
5. Broach.
6. Surat.
7. Navsari.
8. Jagadia.
9. Kadi.
10. Bawla.
11. Viramgam.
12. Miraj.
13. Bailhongal.
14. Hubli Kumpta.
15. Comptas.
16. Uplands.
17. Nandyal.
18. Westerns (Guntakal).
19. Northern Cambodia.
20. Tirupur.
21. Tirupur Cambodia.
22. Karungannies.
23. Africans.

It is intended that tests on these cottons shall be carried out year by year. There will thus be three series of test-reports on the cotton crop each season ; in the first place there will be the reports on the standard cottons, mostly supplied by the Agricultural Departments, which have been tested since the Laboratory started its work in 1924 ; secondly, there will be the tests on the first arrivals of the commercial types ; and thirdly, there will be the tests on the average commercial crop of the season of each type. There can hardly be any doubt that these series of reports will be of the greatest value as the results of the tests accumulate year by year.

III. RESEARCH LABORATORY.

Considerable progress has been made towards the solution of the main problem of the Technological Laboratory, the relation between fibre-properties and spinning value. The complexity of the problem has necessitated a statistical method of approach, and as a consequence no safe conclusions could be drawn until a large amount of data had been accumulated. At the completion of the tests on the standard cottons of 1929-30, however, full results were available for no less than 95 samples of cotton ; for these cottons we knew the spinning value and the following fibre-properties ; length, weight per inch, strength, width, convolutions, and rigidity ; and for 45 of these samples we knew the clinging power as well. From the results obtained a formula has been developed by means of which highest standard warp counts can be predicted with fair accuracy from a knowledge of the fibre-properties. There still remain, however, a certain number of anomalies, and it is on these that the present and future research work is being concentrated. A bulletin dealing with the results of the tests on these cottons is now in course of preparation.

A number of bulletins have already been published on the research work of the Laboratory ; these deal with different aspects of subsidiary problems arising out of the main problem. These bulletins constitute the

B series of technological bulletins. The number of these issued annually is naturally increasing as results are obtained in the Research Laboratory. It is noteworthy that while in the earlier days the training of the staff was in the methods of cotton technology, the work has so advanced that it now involves training in the writing of reports, and the development of clarity of thought, lucidity of expression, and orderly arrangement. The results of this training are shown in the number of joint papers now being issued from the Laboratory.

Fibre-testing Section.—It is a function of this section to make fibre tests on all the cottons which are subjected to spinning tests, and most of the time of the members of the staff working in this section is occupied in this way. In some cases, however, cottons are received in quantity which is insufficient for spinning tests, and in such cases it is the custom to make fibre-tests only. The routine tests comprise the determination of fibre-length and fibre-length distribution, the fibre-weight per inch, the fibre-strength by both the Q'Neill method and the Balls Magazine Hair Tester, the fibre-rigidity, the fibre-width, and the number of convolutions per inch. This section has been severely tested by the very large increase in the number of samples received during the past year, as will be evident from a consultation of the table on page 48.

Physics Section.—The results of much of the work done in this section are described in Technological Bulletins, Series B, Nos. 6-10, of which summaries are given in Section IV, Publications, pages 61–71. The work at present in progress includes the following :—

1. The sampling of cotton for the determination of fibre-properties. Parts I, II, and III have been completed (see "Publications"). Part IV dealing with the interrelationships of the different fibre-properties is being written up.

2. The frequency-distribution of various fibre-properties among fibres taken from a single cotton seed, and the variation of a property in relation to the position of the fibre on the seed.

3. The effect of humidity on fibre-strength ; this investigation is now complete and ready for writing up.

4. The strength of cotton fibres under different degrees of torsion.

5. The variation of single-thread yarn strength with the length of specimen.

The moisture content of cotton.—This subject has for some years past excited considerable interest throughout the world. The matter, so far as it relates to Indian cottons, has recently been brought up by the East India Cotton Association, who have kindly supplied five bales of cotton for these experiments. One bale of Berar cotton is being weighed at the Laboratory on a platform weighing machine which has been modified so as to make it possible to obtain a continuous record of the weight of the bale under fluctuating conditions of humidity throughout the year. At the same time parallel experiments are being carried out on small lots of cotton subject to different degrees of compression.

The differences in weight experienced by bales at the Cotton Exchange are also being measured. For this purpose two bales, Broach and Berar, are kept in a godown at the Exchange and are subjected to weekly weighings; continuous records are taken of the humidity and temperature at the godown; moreover, two other bales, Broach and Bengals, are kept in one of the rooms of the Cotton Exchange, and are also weighed weekly, continuous records being also taken of the temperature and humidity in the room.

These experiments were started before the monsoon of 1930, and will eventually enable us to ascertain the normal moisture-content of cotton bales in Bombay when subject to certain atmospheric conditions of humidity.

Chemistry Section.—The chief work carried out in this section has been the determination of some of the chemical constituents of the standard Indian cottons of 1929-30, viz., the ash left by each cotton on combustion, and the nitrogen, phosphorus, and wax contents of the cottons—including the determination of a number of constants for each wax (melting-point, iodine value, and saponification value).

In the Annual Report for 1927-28 a short account was given of an attempt to determine by physical means the percentage of Punjab-American and *desi* cottons present in a mixture of the two. The conclusion was reached, however, that the method could not be applied successfully, so that the problem still remained unsolved. The investigation has since been taken up in the Chemistry Section, in an attempt to distinguish Punjab-American and *desi* cottons by means of staining and microscope tests. This work has already yielded some promising results, and is therefore being continued with a view to ascertaining whether it will provide an accurate quantitative analysis of a mixing of the two types of cotton.

Microscopy Section.—An investigation is being made of the degree of maturity of the cotton fibre, as indicated by ribbon-width and wall-thickness, and its relation to neppiness.

IV. PUBLICATIONS.

The following is a list of publications which have been issued during the year :—

I. Technological Circulars Nos. 19-34, as under :—

Circular.	Cottons.	Date of Publication.
19	Verum 262, 1929-30	January 1930.
20	Umri Bani, 1929-30	January 1930.
21	Punjab-American 4F, 1929-30	February 1930.
22	Punjab-American 289F, 1929-30	February 1930.
23	Fine and Superfine Khandesh	February 1930.
24	Fine and Superfine C. P. No. 1	February 1930.
25	Fine and Superfine Berar	February 1930.
26	Fully Good and Fine Muttia	February 1930.
27	Latur, Nanded, and Punjab-American	February 1930.
28	Dholleras, and Kadi-Viramgam	May 1930.
29	Broach	May 1930.
30	Jagadia, Surat, and Navsari	May 1930.
31	Kalagin	June 1930.
32	Farm Western, Bijapur, and Bagalkote	June 1930.
33	Coompta, Cambodia, and Karunganni	June 1930.
34	Westerns, Gadag-Upland, and Tinnevelly	June 1930.

II. Technological Bulletins, Series A, Nos. 14-16 :—

1. Series A, No. 14, June 1930, Technological Reports on Standard Indian Cottons, 1930, by A. James Turner, M.A., D.Sc.

2. Series A, No. 15, June 1930, Preliminary Spinning Tests on Mixings of Indian and American Cottons Using Ordinary and High Drafts, by R. P. Richardson, A.T.I., and A. James Turner, M.A., D.Sc.

3. Series A, No. 16, June 1930, Technological Report on Banilla Cotton, by A. James Turner, M.A., D.Sc.

III. Technological Bulletins, Series B, Nos. 5-10 :—

1. Series B, No. 5, January 1930, A Comparison of Some Methods of Testing the Breaking Strength of Single Cotton Fibres, by Harirao Navkal, M.Sc., and K. R. Sen, M.Sc.

2. Series B, No. 6, April 1930, Studies in the Sampling of Cotton for the Determination of Fibre-Properties: Part I: Introductory and Experimental; Part II: Frequency Curves for Various Fibre-Properties, by Ram Saran Koshal, M.Sc., and A. James Turner, M.A., D.Sc.

3. Series B, No. 7, May 1930, The Weight per Inch of Fibres of Different Lengths, and the Numbers of Fibres of Different Lengths per Seed, for Each of the Standard Indian Cottons, by R.L.N. Iyengar, B.Sc., and A. James Turner, M.A., D.Sc.

4. Series B, No. 8, July 1930, The Foundations of Yarn-Strength and Yarn-Extension, Part III : The Clinging Power of Cotton, by Harirao Navkal, M.Sc., and A. James Turner, M.A., D.Sc.

5. Series B, No. 9, August 1930, The Foundations of Yarn-Strength and Yarn-Extension, Part IV : The Influence of Yarn-Twist on the Diameters of Cotton Yarns and on the Proportions of Fibre-Slippage and Fibre-Fracture in Yarn-Breakage, by A. N. Gulati, M.Sc., and A. James Turner, M.A., D.Sc.

6. Series B, No. 10, September 1930, Studies in the Sampling of Cotton for the Determination of Fibre-Properties, Part III : The Size and Reliability of a Satisfactory Sample, by Ram Saran Koshal, M.Sc., and A. James Turner, M.A., D.Sc.

Reference has already been made to new features of Technological Reports on Standard Indian Cottons ; the following are the summaries of the other bulletins :—

Preliminary Spinning Tests on Mixtures of Indian and American Cottons Using Ordinary and High Drafts.—It is pointed out that a better quality of yarn may be obtained either by using a better quality of raw cotton, or by employing some improved process of spinning. The use of high draft mechanism is one means of achieving the end by the second alternative. The various schemes of employing high drafting are briefly discussed with reference to the possibility of obtaining either a decreased cost of production without reduction in the quality of the yarn, by eliminating one or more preparation processes, or a higher quality yarn from a given mixing, or the same quality of yarn from a cheaper mixing.

In order to investigate these matters, and also the conditions under which cottons of different lengths might be spun together without difficulty, spinning experiments have been made on 40-lb. lots of American (Texas) and Indian (C. P. Wun) cottons. Each cotton was first spun separately on four different systems, viz., (1) single roving, ordinary draft ; (2) double roving, double draft, ordinary frame ; (3) and (4) double roving, double draft, on two different systems of high draft spinning ; in each system the cotton was spun into two different counts with two different twist-constants each. A similar series of spinnings of three different counts, with two different twist-constants each, was then made, using various mixings of the American and Indian cottons, viz., 75 per cent. American and 25 per cent. Indian ; 50 per cent. American and 50 per cent. Indian ; and 25 per cent. American and 75 per cent. Indian. When these experiments were

completed, a further test was made, viz., spinning direct from single intermediate roving, prepared from a mixing of 50 per cent. American and 50 per cent. Indian cottons.

Full details are given of the cottons, the machinery, the spinning procedure, the behaviour in spinning, and the evenness, neppiness, and strength of the yarns spun; in all, 3,536 tests were made for lea strength and counts, 3,536 for ballistic work of rupture and counts, and 2,600 for twist. The results of the various observations and tests are discussed, and the following tentative conclusions are drawn :—

(1) There is no difficulty in spinning a mixing of two types of cotton having mean fibre-lengths differing by 0.15 inch. when they have approximately the same fibre-weight per inch.

(2) On a good high-draft system it is possible to spin as good a yarn direct from intermediate roving as from ordinary roving on the ordinary system.

(3) By spinning from double roving and using double draft on a high draft system, it is possible to obtain a yarn of decidedly higher quality than that produced on the ordinary system, with at least as high a rate of production.

(4) Using a mixing containing equal quantities of suitable American and Indian cottons, it is possible to spin on a high draft system a 20's yarn at least equal in quality to a similar yarn spun from the American cotton alone, with a considerable saving in the cost of the mixing and no loss in production.

Technological Report on Banilla Cotton, 1924-30.—*Banilla* is the name which is now given to a cotton first styled *BXX27*, and later called *Dhulia* 1, on account of its having been bred at Dhulia; it was first derived some nine years ago as a descendant from a cross made in 1908 between the two cottons *Bani* (*Gossypium indicum*) and *Comilla* (*Gossypium cernuum*). *Bani* cotton has the desirable lint characters of length and silkiness, and *Comilla* cotton has the desirable agricultural characters of high ginning percentage and high yield. The *Banilla* cross has been isolated and developed with a view to substituting a high-yielding cotton of good quality lint for the very coarse types at present commonly grown in Khandesh.

Trials of the *Banilla* cotton have been made in various parts of Khandesh, and the area under it has steadily increased in successive seasons, as will be

clear from the following figures for the area under *Banilla* for the seasons from 1926-27 onwards—

Season.	*Acreage.*
1926-27	50 acres.
1927-28	400 ,,
1928-29	2,000 ,,
1929-30	30,000 ,,
1930-31 (estimated)	100,000 ,,

The total crop of 1929-30 amounted to over 7,000 bales.

The report summarises the various fibre and spinning test results which have been obtained for the cotton since the season 1924-25, and concludes with a general discussion of the results for the cottons grown in the different areas and seasons ; a comparison is also made with the results obtained for some samples of the local Khandesh *roseum* cotton (N.R.) grown under similar conditions to the *Banilla* samples. The cotton in the best districts and in the best seasons has been found suitable for counts up to 20's, but in other districts and other seasons it shows a considerable falling off so that it appears that the cotton is subject to variation on account of climatic differences.

A Comparison of Some Methods of Testing the Breaking Strength of Single Cotton Fibres.—The present paper deals with the merits and demerits of three types of instruments, which are used for the determination of the breaking strengths of single cotton fibres, viz., the hydrostatic (O'Neill's), the balance (Barratt's), and the pendulum (Balls' Magazine Hair Tester).

Various results are given for the different instruments. It is shown that the mean obtained by Barratt's is higher than that obtained by the other two, of which O'Neill's gives the higher value. Replacing the water in the latter instrument by calcium chloride so as to regulate the humidity at which fibres are broken, lowers the mean and renders it but little different from that obtained by the Magazine Hair Tester. Results obtained at the Technological Laboratory for 39 cottons tested on both the instruments are given, from which it is deduced that, on the average, the Magazine Tester gives a value which is only 2½ per cent. greater than O'Neill's ; a part at least of this difference is attributed to the greater speed at which fibres are broken by the Magazine Tester.

The errors of the three instruments are discussed in detail. It is concluded that the value got by the Barratt Tester is much higher than that got by the other two, both of which seem to agree fairly well if a large number of readings are taken and if calcium chloride solution is used instead of water in the O'Neill Tester ; the Magazine Tester has the advantage in speed of working and the O'Neill Tester in economy of first cost.

Studies in the Sampling of Cotton for the Determination of Fibre-Properties. Part I—Introductory and Experimental, Part II—Frequency-Curves for Various Fibre-Properties.—Part. I.—It is pointed out that for the determination of the value of any fibre-property of a cotton, a small sample has to be selected for the experiment. Three questions, therefore, arise, viz: (1) How we may obtain a satisfactory sample, (2) how many fibres constitute a satisfactory sample, (3) what is the degree of reliability of the results obtained for the value of a fibre-property? The present investigation has therefore been undertaken primarily with a view to obtaining satisfactory answers to these three questions for the following fibre-properties—length, width, number of convolutions, strength, and rigidity. The tests of these properties have been made on some 3,000 fibres of Surat 1027 A. L. F. 1926-27; the description of these tests and the discussion of the results is divided into four parts, the first two parts forming the present paper. Part I is introductory and contains also a description of the experimental methods used for the measurement of the fibre-properties; Part II deals with the frequency-curves for the various fibre-properties; Part III deals with the three questions of sampling in the light of the results discussed in Part II; and Part IV will deal with the interrelationship of the different fibre-properties.

Part II.—The answers to the questions formulated in Part I depend upon the manner of distribution of the test-values. Frequency-polygons are drawn to indicate the various frequency-distributions. But as the results obtained relate only to comparatively small samples, theoretical continuous frequency-curves have been drawn by a recognized method to give the closest possible degree of fitting to the frequency-polygons. It is found that the frequency-distributions for fibre-length and convolutions are moderately symmetrical and nearly normal; for fibre-width, symmetrical and practically normal; for fibre-strength, moderately asymmetrical; and for fibre-rigidity, extremely asymmetrical. The causes of the asymmetrical distributions of fibre-strength and fibre-rigidity are discussed at some length and are finally ascribed either to a change in the external conditions of growth during the life-history of the plant, or to the mutual interference of the fibres under the ordinary conditions of their growth.

An appendix is given explaining various statistical terms and methods used in curve-fitting, with detailed examples of their applications to fibre-properties.

Part III.—The Size and Reliability of a Satisfactory Sample.—The chief object of this Part has been the assigning of the minimum number of tests which can be regarded as satisfactory for the determination of the ollowing fibre-properties: length, width, convolutions, strength, and rigidity. The chief method employed has been the comparison of the mean values of small samples of various sizes with the mean value of a large sample, the latter usually comprising 3,000 individual test-values. In order to obtain a large number of samples of any given size, the "moving-mean method" has been used. By inspection of the frequency-distribution of

the means of the samples of each size, the proportion of the means lying between any assigned limits has been ascertained, and thus the odds that any single mean of a sample of the given size will lie between these limits. The odds applicable to the same limits for the means of samples of the same size, normally distributed with a probable error of a single observation calculated from that of the whole bulk of the material, have also been given, in order that the experimentally ascertained odds might be compared with the purely theoretical normal odds. The results have also been investigated for each fibre-property by comparing the dispersion of values of small and large samples, and by comparing the actual frequency-distributions of small samples with the theoretical frequency-distribution of a large sample.

The following are the conclusions arrived at as a result of the present analysis :—

1. Although the method of sampling adopted must usually be decided from certain general considerations, we have been able to show that the method of selecting individual fibres from a carefully prepared sliver in which the fibres have been thoroughly mixed, shows a bias in favour of the selection of the longer fibres, and is therefore inferior to the method of selecting small bunches of fibres from different parts of the sliver, and testing every fibre in each bunch so selected.

2. The mean value (i.e., the arithmetic mean) is usually satisfactory as a single value representing all the test-values obtained for a sample, but in the case of fibre-rigidity, for which the distribution is extremely asymmetrical, caution must be exercised in the use of the mean value as it is greatly affected by high individual values which are sometimes *ten times* as large as the arithmetic mean.

3. In the case of fibre-length, fibre-width, and convolutions, which give nearly symmetrical frequency-distributions, the mean value and the probable error of a single observation are quite sufficient to indicate the composition of a sample. But in the case of fibre-strength, and more particularly in the case of fibre-rigidity, it is desirable to indicate the composition of a sample by means of the upper and lower quartiles, in addition to the mean value.

4. The degree of reliability of small samples is indicated in the following table which shows the total range, expressed as a percentage of the mean, for which the odds are as indicated that the mean of a random sample of the given size will lie therein :

Range (% of mean) within which the odds are as shown that the mean of a random sample will lie.

Fibre-property.	Odds.	Size of sample.				
		200	300	400	500	600
Fibre-length	20 : 1	18	16	13	11	9
Fibre-width	20 : 1	4	2.7	2	..	..
Convolutions	20 : 1	30	24	20	19	18
Fibre-strength	20 : 1	40	23	17	15	13
Fibre-rigidity	5 : 1	..	60	55	48	44

Thus from col. 3, we see that the odds are 20 : 1 that the mean fibre-width of a random sample of 200 fibres will lie within a range of 4 per cent. of the mean, =2 per cent. on either side of the mean, seeing that the distribution of values of fibre-width is symmetrical.

5. In the selection of a certain size of sample as representative we are guided partly by the degree of reliability of the result for that size, and also by practical consideration of the difficulties of making a very large number of tests. Bearing both these points in mind we consider the following are the minimum numbers of tests which should be made in the determination of the several fibre-properties by the methods described in Part I :—

Fibre-property.	No. of figures for representative sample.	Total range (% of mean) for which the odds are 20 to 1 that the random sample will lie therein.
Fibre-length	500	11
Fibre-width	300	2.7
Convolutions	500	19
Fibre-strength	500	15
Fibre-rigidity	500	48 (odds 5 : 1)

6. The results obtained in this investigation relate for the most part to Surat 1027 A.L.F. only. But, as remarked in Part I, this cotton was specially selected because previous tests had shown that the individual test-results displayed great variation. Consequently it may be inferred that the results obtained from any given number of tests of a certain property of another cotton will be at least as reliable as those obtained from the same number of tests of the same property of Surat 1027 A.L.F.

The Weight per Inch of Fibres of Different Lengths and the Numbers of Fibres of Different Lengths per Seed, for each of the Standard Indian Cottons. —The object of the investigation has been to determine the values of the fibre-weight per unit length for different lengths of fibre of a given cotton, with a view to ascertaining whether any differences therein affect the value of the mean fibre-weight as determined by the ordinary cutting method, in which any such differences are ignored. The work has been extended so as to make possible the calculation of the average number of fibres per seed for each cotton.

The material for investigation consisted of 18 standard Indian cottons and five American cottons. The seed-weight and lint-weight per seed were determined for a weighed amount of *kapas* (seed-cotton) of each Indian cotton ; the ginning percentage was then calculated ; the lint was used for the determination of the percentage distribution of length by the Balls sorter, and for the determination of the fibre-weight per centimetre as follows :—By means of the Baer sorter, fibres of different lengths were grouped together, the centimetre-lengths were cut from each group, and the fibre-weight per centimetre was determined for each group-length.

From these tests the following conclusions are drawn :—

(1) It cannot be accepted as universally true that the fibre-weight per unit length is the same for different lengths of fibre of a given cotton.

(2) For the *hirsutum* cottons, the fibres of longer lengths of a given cotton generally have less fibre-weight per inch.

(3) The *herbaceum*, *neglectum*, and *indicum* cottons do not generally show any large change of fibre-weight with fibre-length ; the chief exceptions are Aligarh A. 19 and Mollisoni, both of which have in each season a much less fibre-weight in the longer lengths.

(4) In spite of the variation of fibre-weight with fibre-length in some cases, the effect upon the mean fibre-weight is not sufficient to make this essentially different from the value obtained by the ordinary cutting method, in which any such variation is ignored. But there still remains the possibility that the cutting method may give rise to erroneous results owing to the variation of fibre-weight along the length of a single fibre.

(5) The number of fibres per seed may differ greatly for different species, for different varieties of the same species, or for the same variety in different seasons.

(6) For a series of cottons differing from one another not only in their conditions of growth, but also in variety and species, there is no direct

proportionality between the number of fibres per seed and (1) the lint index, or (2) the ratio of the lint-weight per seed to the seed-weight, or (3) the ginning percentage.

The Foundations of Yarn-Strength and Yarn-Extension. Part III.—The Clinging Power of Cotton.—The present paper describes tests to determine the clinging power of certain standard Indian cottons which had given spinning test results that were somewhat unexpected in view of their other fibre-properties. The method used was a modification of Adderley's, and consisted of pulling a group of 10 fibres of a cotton between pads made from parallelised fibres of the same cotton and subjected to a known pressure; the pads were $\frac{3}{8}$ inch long; the force was applied and measured by means of an O'Neill's fibre-strength tester. The clinging power is taken to be the force required to pull the 10 fibres through the pads under a known pressure. The various sources of errors are discussed, and the conclusion reached that these are not serious.

Some preliminary experiments were made to determine the effect of differences of pressure between the friction pads, and finally a load was chosen to produce such a pressure as would not differ greatly from that experienced by the fibres of a yarn on the point of breaking under tension. This load was used in all the subsequent experiments. The following are the conclusions reached in the experiments on various standard Indian cottons using standard pressure between the friction pads :—

(1) The clinging power depends upon the pressure acting on the fibres, increasing as the pressure increases, though the relative magnitude of the increase is not so rapid as that of the pressure itself.

(2) The cottons which are suitable only for comparatively low counts tend to have a high individual clinging power; it is possible that this property is partly responsible for the irregularity of the yarns spun from them and for the impossibility of spinning them economically to a high count.

(3) There is comparatively high correlation between the highest standard warp counts and the clinging power of the whole fibre per unit fibre-weight per inch, showing that there is a tendency for those cottons which have high clinging power in relation to their length and fineness to be spinnable to a comparatively high standard count.

(4) The clinging power per unit fibre surface shows less variation than the clinging power or the clinging power of the whole fibre per unit fibre-weight per inch; and it appears that even if the clinging power per unit fibre surface is not the same for different cottons, it is at any rate a property which is unrelated to the highest warp counts to which a cotton can be spun.

(5) The shorter and coarser cottons tend to have higher individual clinging power, but in the yarn the greater number of the finer and longer fibres present offsets the greater individual clinging power of the coarser fibres, so that the finer fibres actually have a much higher total clinging power in a yarn of a given count.

The Foundations of Yarn-Strength and Yarn-Extension. Part IV. —The Influence of Yarn-Twist on the Diameters of Cotton Yarns and on the Proportions of Fibre-Slippage and Fibre-Fracture in Yarn-Breakage.— Experiments are described to ascertain the relation between the strengths of yarns prepared with different degrees of twist and the relative proportions of fibre-breakage and fibre-slippage which occur at yarn-breakage. Measurements have been made on the five cottons, 1027 A.L.F., Punjab-American 4F and 289F, Umri Bani, and Nandyal 14, in three different counts, viz., 20's, 30's, and 40's ; and on Mollisoni in 10's counts. The tests were made on specimens of yarn 3 inches long ; each test-piece was given a certain twist; its breaking strength, its weight, and the numbers of fibres breaking and slipping respectively at yarn-breakage were determined, and also the fibre-weight of the fibres constituting the yarn. Measurements were also made of the diameters of the yarns at the different degrees of twist. Each cotton was spun in the form of mock-grandrelle yarn to permit of the twists being counted in the 3-inch specimens of yarn by means of a lens. A testing-machine is described which was adapted from a twist-testing machine and used for inserting or removing any desired amount of twist, and also for determining the strength of the yarn. Experiments were made at nine different degrees of twist, viz., from 10 to 90 turns per 3-inch length, at intervals of 10 turns. Twenty specimens were tested at each degree of twist ; only specimens were selected which appeared to the eye to be regular in diameter throughout the 3-inch length.

The following conclusions are drawn from these experiments :—

(1) The diameter of a cotton yarn of a given twist per inch (n) and count (c) falling within the 20's-40's range can be obtained by substituting the values for the counts and twist in one of two formulæ, neither of which contains any arbitrary constants. The simpler formula, that the diameter in millimetres (d)$= \frac{1.0}{\sqrt{c}\ \frac{4}{3}n}$ applies over the practical range of twists, but not at low twists.

(2) A cotton yarn suffers only a slight change in diameter when it is placed under tension.

(3) The distribution of twist in a yarn of varying diameter is such that the number of turns of twist in any part of the yarn is approximately inversely proportional to the number of fibres in that part ; as a consequence

of this unequal distribution of twist, the diameter of the yarn at any given cross-section is directly proportional to the number of fibres at that cross-section.

(4) When only uniform specimens of yarn are tested for strength, the strength of the single yarn increases with the twist in 10's to 40's yarn until 30 turns per inch have been inserted. The most rapid increase for 20's and 30's yarn is between 7 and 17 turns per inch ; for 40's yarn the most rapid increase of strength is between 10 and 13 turns per inch. The influence of twist is so small at low twists that up to 7 turns per inch the breakage of the yarn takes place almost entirely by fibre-slippage.

(5) The maximum yarn-strength values of the individual cottons do not reflect their highest suitable warp counts ; it is therefore concluded that some of the fibre-properties are important not so much for the strength they confer at the place of breaking as for the fact that they determine the frequency and degree of thick and thin places in the yarn.

(6) There is a very close relation between the percentage of fibre-fracture and yarn-strength, over 60 per cent. of the fibres breaking at high twist when the yarn-strength is at its highest, and very few fibres breaking at low twist when the yarn-strength is very small indeed.

(7) The values for the percentage of fibre-strength utilized, as calculated from the single-thread strength in relation to the product of the fibre-strength and number of fibres in the cross-section, show that in some cases the percentage actually exceeds 100. The existence of these high values is attributed to the deliberately biassed selection of the specimens of yarn used in the testing, by virtue of which full scope is given for the display of the accession of strength possible by doubling together a number of fibres whose strength varies greatly along their length.

V. GENERAL.

(1) *Staff.*—The staff of the Laboratory on 31st August 1930 was as follows :—

Director.—A. James Turner, M.A., D.Sc.

Assistant Director.—Nazir Ahmad, M.Sc., Ph.D.

Research Laboratory.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc.; Ram Saran Koshal, M.Sc.

Temporary Research Assistant.—C. Nanjundayya, M.Sc.

Junior Testing Assistants.—S. S. Sukthankar, L.T.C.; K. G. Deo; H. B. B. Joshi, B.Sc.; K. S. Marar, B.A., LL.B.; R. G. Panvalkar, B.Sc.; P. H. Sharma, B.A.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc. Tech., M.Sc., A.I.I.Sc., A.T.I.

Microscopy Section :—

Junior Research Assistants.—H. N. Dutt, B.Sc., M.B.; Amarnath Gulati, M.Sc.

Instrument Maker.—Moreshwar M. Patke.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, A.T.I.

Senior Research Assistant—

(Assistant Technologist).—D. F. Kapadia, B.Sc. Tech., B.A.

Yarn Testing Section :—

Statistician.—V. Venkataraman, M.A.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographer.—B. P. Jain.

Clerk.—M. T. Sundaram.

Draughtsman.—B. G. Mehta.

Dr. Turner returned from leave and resumed his duties as Director on 6th December 1929.

Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), was appointed to the new post of Assistant Director of the Laboratory, and took up his duties on 17th March 1930.

Mr. R. P. Richardson officiated as Director until the return from leave of Dr. Turner, when he reverted to his post of Spinning Master. Mr. Richardson proceeded on leave as from 2nd June 1930, for 3 months and 18 days, during which period Mr. Narasimha Iyengar officiated as Spinning Master.

Mr. Ram Saran Koshal was promoted to be a Senior Research Assistant as from 1st July 1930.

Mr. H. N. Dutt proceeded on privilege leave, combined with study leave in America, on 4th August 1930, for a period of nine months.

Mr. C. Nanjundayya, on the termination of his research studentship, on 31st July 1930, was appointed Temporary Research Assistant in the Laboratory, as from 1st August 1930.

Mr. P. H. Sharma, B.A., was appointed on 15th October 1929 to the post of Junior Tester rendered vacant by the appointment of Mr. H. R. Nayak to be Technological Assistant to the Cotton Breeder, Dharwar.

In view of the increasing number of spinning tests, three additional posts of Junior Tester were created at the twenty-first meeting of the Committee in July 1930. These posts were filled on 28th July 1930 by Messrs. U. K. Benegal, P. V. Nachane, and A. J. Farid, the last named having previously been appointed temporarily on 13th January 1930.

(2) *Research students.*—Mr. C. Nanjundayya has completed his work on the variation of fibre-weight along the length of the fibre, for the standard Indian cottons of two seasons ; the results show that as a rule the cotton fibre is much finer towards its apex than in any other part. These results have much significance as regards the determination of fibre-weight per inch, and Mr. Nanjundayya has therefore made some further experiments comparing the fibre-weights obtained by the cutting method with those obtained by mixing whole fibres for weighing.

Mr. Srinaghabhushana has now completed his investigation of the changes in the fibre-properties of a number of standard Indian cottons at various stages in the spinning preparation, and is preparing a paper on the results.

(3) *Buildings and equipment.*—No additions or alterations have been made to the buildings during the year.

Additions have been made to the spinning room, as previously mentioned. A 48-spindle ring frame has been supplied by Messrs. Tweedales and Smalley. This frame has a tape-drive for the spindles, and is fitted with a 4-line roller high draft system on one side, and with rise-and-fall thread-guides. The frame is driven by a 1-h.p. variable speed individual motor supplied by the English Electric Co.

A similar 48-spindle frame, fitted with the C.S.L. high draft system on one side and a 3-line roller high draft system on the other, is being supplied by Messrs. Platt Bros.

In order to allow of experiments on the effect of the speed of the beating in the Crighton Opener, an order has been placed with Messrs. Asea Electric for the supply of a variable speed commutator motor to be direct-coupled to the beater shaft.

Additional testing apparatus has been obtained in order to cope with the increase in the yarn-tests resulting from the larger number of spinning tests: a power-driven lea tester had already been installed, and the new machines are a Goodbrand Ballistic Testing Machine, a Baer Twist-Counter, an Avery Yarn Wrapping Scale, and an Avery Platform Weighing Machine.

VI. ACKNOWLEDGMENTS.

No account of the work of the Laboratory would be complete without an acknowledgment of the valued assistance received from several members of the East India Cotton Association who have undertaken the grading of the various samples of cotton submitted to the Laboratory for spinning trials; the Grader's report has formed an integral and valuable part of all spinning test reports.

In conclusion I am pleased to say that the work of the staff of the Laboratory has continued to be of the same high standard set in previous years. I cannot thank them sufficiently for the ready and willing manner in which they have accorded me their support throughout the past seven years; the nature of their work has necessarily been of a very tedious character, often involving considerable eye-strain; and for long periods at a time the tests have to be carried out under most adverse climatic conditions, during which the nature of the material being handled does not permit of the relief from moving air which is usually available in the tropics. And it must ever be remembered that it is on the continued devotion of the staff that the whole of the service rendered by the Technological Laboratory depends.

A. JAMES TURNER,

Director, Technological Laboratory.

30*th October* 1930.

APPENDIX I.

LIST OF RESOLUTIONS.

" The Central Cotton Committee expresses its thanks to the Honourable Minister for Agriculture, Bombay Presidency, for convening a Conference of all interests concerned to discuss the working of the Cotton Transport Act in Surat District and hopes that, as a result, the question of the re-imposition of the restrictions on road transport will be placed before the Bombay Legislative Council at the earliest opportunity."

" The Central Cotton Committee views with anxiety the serious risk of losses to the cotton growers by the continuance and extension of the practice of mixing Punjab-American and *deshi* cottons in the Punjab and invites the attention of the Punjab Government to the urgency of adopting measures to check this malpractice. The Committee has considered proposals for organizing co-operative sale societies for the production and marketing of pure Punjab-American cotton and is prepared to pay half the cost up to a limit of Rs. 5,000 of a whole-time officer and the necessary staff for the period of one year for work in this direction."

" The Central Cotton Committee note with satisfaction that Baroda and the States of the Rewa Kantha Agency have agreed to the proposed Nerbudda-Mahi protected area. The Central Cotton Committee hope that the Bombay Government will issue the necessary notification to enable the whole area to be protected."

" The Central Cotton Committee consider that the report of the Director of Agriculture, Madras Presidency, on the working of the Cotton Transport Act in the amalgamated Southerns area should be brought to the notice of the Government of Madras with the object of having the effect of the amalgamation on the improvement of cotton in this area kept under close observation during the next year."

"The Central Cotton Committee note with satisfaction that the Central Provinces Government have given effect to the request of this Committee regarding the application of the provisions of the Cotton Transport Act to a combined Central Provinces and Berar zone. The Committee is convinced that this action will result in the valuable Central Provinces and Berar cottons obtaining their full value in future owing to the exclusion of the inferior cottons from outside the Province which were used for substitution and mixing."

" The Central Cotton Committee desire to place on record their appreciation of the action of the Holkar Durbar in acceding to the Committee's request to apply the provisions of the Cotton Transport Act to Indore State."

" The Central Cotton Committee note with satisfaction that the Karachi Joint Cotton Committee have amended their bye-laws for contracts so as to make effective in the Karachi market Section 14 of the Cotton Ginning and Pressing Factories Act, 1925."

" The Central Cotton Committee request the Gwalior Durbar to introduce at an early date an Act similar to the one in British India for the regulation of Cotton Ginning and Pressing Factories. Gwalior is the third largest cotton-producing State in India and with approximately an annual outturn of one lakh bales considerable advantage would be gained to the trade and to the authorities responsible for the preparation and checking of forecasts if pressing returns are introduced in the State."

" The Indian Central Cotton Committee desire to draw the attention of the Government of India to the unsatisfactory delays in the publication of the All-India Cotton Forecasts, the prescribed dates for which are :—

1st Forecast	15th August.
2nd ,, ...	15th October.
3rd ,, ...	15th December.
4th ,, ...	15th February.
Supplementary Memorandum	15th April.

During the last five years, delays of from three to nineteen days have occurred in the publication of each of the forecasts. The Committee therefore request the Government of India to adhere to the prescribed dates or in the event of a possible delay to give early intimation to the Indian Central Cotton Committee of the exact date of publication.

The Indian Central Cotton Committee also consider the present method unsatisfactory of issuing forecasts piece-meal from each province and later from Calcutta as the trade in Bombay is kept in ignorance of the figures for some considerable time. The Committee commends for favourable consideration that they be telegraphed as soon as they are compiled to the office of the Indian Central Cotton Committee which will make immediate arrangements to inform the trade through the East India Cotton Association, Ltd."

" The Central Cotton Committee approve of the action of the Local Sub-Committee in addressing the Government of India asking for voluntary returns of raw cotton consumed in mills in the minor Indian States instead of calculating this figure from yarn production."

" That the attention of Directors of Agriculture and other officers responsible for the preparation of cotton forecasts be invited to the discrepancies between the estimates and the press returns and that they be asked to ascertain the cause of the differences. The re-introduction of the rail-borne traffic returns for cotton will be of great help in these investigations."

" The Indian Central Cotton Committee desire to draw the attention of the Government of India to the present low level of cotton prices which are below the cost of growing and the resultant injury to the growers and to the economic condition of the country. The Committee consider that effective practical means should be devised for alleviating the risk of ruin to the cotton grower if the growing crop is to be marketed at or about Rs. 140 for Bengals, Rs. 170 for Oomras and Rs. 200 for Broach.

The Committee also ask the Local Sub-Committee to confer with the Government of India in this connection should Government desire to consult them."

" The Central Cotton Committee desire to thank the Government of Bombay for agreeing to consult the Committee in matters pertaining to cotton under the Sukkur Barrage."

" The Indian Central Cotton Committee invite the attention of the Madras Government to the letter from the Tuticorin Chamber of Commerce. In the opinion of the Committee the re-establishment of *Pulichai* cotton in Tinnevelly is ruining the reputation of the cotton of that tract and renders nugatory much of the work of the Agricultural Department."

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the year ended June 30th, 1930.

I. INTRODUCTION.

THIS report covers the fifth agricultural year of the Institute of Plant Industry and should be studied in connection with *the Application of Science to Crop-production*—the quinquennial report of the Institute for the five years ended October 24th, 1929. Bound copies of this work were distributed to the members of this Committee in connection with the eighteenth meeting held at Indore in November 1929. As the quinquennial report contains a detailed account of the purpose, conduct and progress of the Institute and as the members have so recently visited Indore, it is unnecessary in the present progress report to repeat what has already, in a permanent form, been placed before this Committee. It will be sufficient (1) to lay stress on the practical results which are being obtained and (2) to refer to the chief events which have occurred since the visit of the Committee to the Institute seven months ago.

Visit of H. E. the Viceroy.—For the second time in the short history of the Institute, a visit has been paid by the Viceroy. On July 31st, 1929, H. E. Lord Goschen and staff spent the afternoon in going over the work in progress.

Benefactions.—The number and variety of gifts to the Institute show no diminution. During 1930, the following gifts of money and material have so far been received :—

(1) A donation of Rs. 5,000 from the Holkar State towards the cost of future publications.

(2) A donation of Rs. 100 to the library from the local no tables of the Jhelum District of the Punjab made during their visit in January 1930.

(3) A donation of Rs. 100 to the library from the Rasalpura Vocational School, Mhow.

(4) A sum of £10 for the library from Edinburgh University.

(5) A set of the publications of the Indian Institute of Science, Bangalore, from Dr. Gilbert Fowler.

(6) A large road roller from Colonel McLaughlin, late Commander of the Malwa Bhil Corps.

(7) The transfer of the complete group of buildings, known as the old Thagi Jail, including the compound. Up to the present, all but two of these quarters have been occupied by the staff of the Institute. On May 14th last, the whole of these quarters were formally made over to the Institute by the President of the Board of Governors. By this arrangement, the Institute has been saved the cost of erecting no less than fourteen quarters and at the same time has been provided, free of cost, with a very useful building site and with a large grazing paddock.

II. THE EQUIPMENT AND GENERAL LAY-OUT OF THE INSTITUTE.

Considerable progress was made during the year in providing the Institute with the necessary equipment and in getting the plots into a suitable condition for accurate variety trials and field experiments.

The new sales godown for the storage and sale of improved implements and appliances to cultivators is nearing completion and in a few days will be brought into use. By its means all the transactions of the trading account (the capital of which has recently been increased to Rs. 10,000) will be entirely separated from the current work thereby facilitating this branch of the activities of the Institute and preventing all confusion in connection with stores and stock-taking.

Among recent purchases of equipment may be mentioned a weigh-bridge for carts and waggons; a new water tank which serves as an additional fire protection and also provides an ample supply of water for the manufacture of compost and silage; an electrically driven lathe and drilling machine for the blacksmith's shop; a motor for the supply of water to the laboratories.

During the year under report, the quinquennial repair and overhaul of the whole property of the Institute was carried out and all roads, buildings, fences and equipment were placed in perfect order. At the same time, the records of property were revised and the system of quarterly and annual stock-taking was perfected. The whole of the electric installation of the Institute was converted from D. C. to A. C. by the Holkar State. The drainage system of the lands of the whole Institute, including that of the roads, was gone over in detail and rapid progress was also made in the correct grading of the plots so that accurate variety trials and field experiments can be carried out. By the rains of 1932, the Institute will possess 250 acres of perfectly graded and drained land suitable for every kind of experimental work and capable of producing crops at least double those obtained by the cultivators. An object lesson, complete in itself, will also be available for cotton growers and for the Darbars of the Contributing States.

In spite of the rapid progress of the last few years, nevertheless a few items still remain. A new block of quarters for fieldmen will be necessary in the near future to replace the old leaky building now in use. The laboratory grounds and garden will not be completed for another year. The cultivators' camp adjoining the Institute has yet to be provided with permanent current for lighting and working the cinema. It is hoped, with the help of Mr. Palairet, to carry out this item of the programme before the next cultivators' meeting which will be held towards the end of the present year. A good deal of work and expenditure are needed to bring the staff quarters into a thoroughly satisfactory condition—the water-supply will have to be taken in hand as soon as the Residency Area is supplied with more water from the new water scheme now being executed by the Holkar State; current for lights and fans will have to be made available; the present leaky roofs will soon have to be surveyed and replaced by new roofs with Mangalore tiles. A famine relief fund for (1) the purchase of food for the work cattle in famine years and (2) to make up the loss of income from the leased area must be started as soon as ever funds permit. When these various matters have been dealt with, the Institute, as at present designed, will have been completed.

III. Cotton.

"The cotton work of the future must be a well-balanced combination of agronomy and genetics with soil science."

"The Application of Science to Crop-production," Bombay, 1929.

The growing of cotton.—In the quinquennial report, the most profitable directions in which science can be applied to the production of raw cotton in India were discussed and stress was laid on the importance of devising better methods of growing cotton on the black soils. The general conclusion reached is summed up in the quotation at the head of this section. If the methods of growing cotton are of so much consequence then the importance of agronomy should derive support from the figures of average yield of *kapas* obtained on the plots of the Institute on which the new system is being put into practice. That such support is already available will be seen from the yields set out in Table 1;

TABLE 1.—*The yield of seed-cotton obtained at Indore, 1927-29.*

Year.	Area under cotton in acres.	Average yield per acre in lbs.	Rainfall in inches.
1927 ..	53.4	328	24.79 (distribution good).
1928 ..	66.9	394	40.98 (a year of excess rainfall).
1929 ..	93.6	446	23.11 (distribution poor).

The most significant figures, however, are obtained if we compare the yields of the best group of plots in each of these three seasons and also those of the best plot of each year. The results are given in Table 2.

TABLE 2.—*The increase in general fertility at Indore.*

Year.	Area of improved land under cotton.	Average yield in lbs. per acre.	Yield of the best plot of the year in lbs. per acre.
1927 ..	20.60	340	384
1928 ..	6.64	510	515
1929 ..	36.98	578	752

These figures show that, no matter what the amount and distribution of the rainfall may be, the fertility of the Institute lands is steadily rising and that within a period of three years the produce per acre of the best plots has nearly doubled. The figures of future years will therefore be of considerable interest as the cumulative effect of the eradication of permanent weeds, of improved grading and surface drainage and of the application of compost to the ground-nut crop before cotton is only now beginning to appear. The growth of the cotton crop of 1929 was adversely affected by the very low rainfall (23.11) inches and particularly by its irregular distribution. In addition, the sowing of the crop was difficult, germination was poor and a portion of the area had to be re-sown somewhat late in the season. In spite of these disadvantages and of two long periods of drought, the highest average yield on record and the highest yield per individual plot was reached. No manure is imported and no artificials are purchased. The compost used is manufactured from waste products only so that the figures only prove one thing, namely, the great development in cotton growing on the black soil areas of India which can easily be obtained by the cultivators if given effective leadership. Everything points to the conclusion that of the various factors concerned, the actual growing of cotton is the one of greatest importance and that an increasing amount of attention should be paid to this matter during the next twenty years. Compared with the results which follow better farming, the improvement of the variety by itself is a comparatively minor matter. It is therefore not much use trying to improve the variety by itself. The work of the plant breeder should go hand in hand with improved agronomy and then and then only can the great potentialities of the cotton areas of India be realised.

The development of soil colloids during the rains.—After the black soils have been provided with a system of drainage and the surface has been properly graded, the chief limiting factor in the production of cotton is undoubtedly the loss of permeability which follows the excessive development of soil colloids during the second half of the rains. The problem is therefore physical rather than chemical. What is required is the addition to the soil of some cheap substance which will tend to flocculate the colloids and restore aeration. The results obtained during 1929 clearly indicate that sulphur, powdered oil-cakes (safflower and *karanj* cakes) and superphosphate are all beneficial and that the effects of these substances are intensified by ridging the young cotton. The preliminary experiments of 1929 have been repeated on a larger scale during the present year and

two permanent sulphur plots (Nos. 31 and 40) have been established for studying the cumulative effect, both on the fertility and on the permanent colloidal layer in the sub-soil, of annual dressings of 20 lbs. to the acre of powdered sulphur applied in May with and without ridging during the early rains. Another permanent experiment has been started on a recently drained and graded plot (No. 3) to determine the cumulative effect of grading and surface drainage when combined with soil improvement, on actual soil formation. The observations and experience of the last three years indicate that the methods of soil management in use not only bring about better tilth but also increase the depth of soil made use of by the cotton plant.

The development of colloids in the black soils has other consequences besides interfering with growth and the chemistry of the soil. Evidence was obtained during 1929 that this factor is an important pathological agent in the causation of leaf curl, red leaf and cotton wilt and also in the comparative failure of Cambodia and other American cottons when grown as a rains crop on the black soils. It is hoped during 1930 to bring some of this work to the publication stage.

The preparation and application of manure.—During the year under report, a large amount of work has been done on the best methods of preparing an adequate supply of suitable manure for the cotton crop using only such indigenous materials as are at the disposal of the cultivator. Although this work will not be completed until the end of the rains of 1930, nevertheless sufficient progress has been made to indicate its general nature and some of the results which have already been obtained.

Up to the end of 1929, a rough and ready method of composting all forms of vegetable wastes had been devised which was based on the methods in use in China and Japan and described in King's *Farmers of Forty Centuries*. During the present year the process has been brought under rigid chemical, mycological and bacteriological control and a number of simple improvements have been introduced. The time taken in conversion has been shortened from six months to thirteen weeks; the amount of water and earth have been reduced; the process has been made automatic and practically fool-proof. At the same time, a comparison between the Adco method and that in use at the Institute has been carried out which shows that indigenous materials give much better results than the patent mixture of expensive imported artificials. Since the last cotton crop an easy method of converting such refractory material as cotton stalks into a valuable manure (in the short period between two crops) has been accomplished. A sample of this manure, which is very similar to that normally produced from the other materials used in the Institute compost factory will be exhibited at the meeting. Perhaps the most striking and hopeful result obtained is the discovery that only a comparatively small portion of the cattle dung is really necessary for the compost process and the remainder can be used for fuel. For this reason one of the greatest difficulties in getting the process taken up by the people will have been removed.

The results obtained at the Indore compost factory have attracted a good deal of attention and the process is now being copied at a number of places in Central India and Rajputana. This has naturally led to a demand for trained men and women for carrying out the work on proper lines. To meet this demand, it has been arranged to put the whole labour force of the Institute through the compost factory and to issue certificates resembling a simple passport, with a photograph and the thumb mark of the holder, to all the workers, both male and female, who show themselves thoroughly competent. This system will probably be extended to other sections of the work.

As far as can be seen at present, the ideal method of raising cotton on the black soils will be to grow this crop after ground-nuts (for which the land has been manured in May with compost at the rate of 10 to 20 carts per acre),* to apply a dressing of 20 lbs. of sulphur

* This experience appears to contradict the teaching of the text-books to the effect that leguminous crops need no nitrogenous manure. The text-books, however, do not take into account the factor of time—a matter of the first importance in growing a rains crop under Indian conditions.

to the acre in May and to inter-cultivate alternate rows with the Indore ridger as soon as the plants are large enough and then to complete the ridging about ten days later when the plants have formed the first pair of permanent leaves. The best results can only be obtained on properly graded fields which have been provided with surface drainage, the cotton being sown in the direction of the greatest slope. Ridging must be stopped just before the cotton comes into flower as the passage of the work cattle through the crop destroys the opening buds.

The Indore ridger.—During the rains of 1929, a simple implement for the inter-culture of cotton and other monsoon crops was devised. The results obtained were so satisfactory that through the good offices of Mr. S. D. Saklatvala, the Vice-President of this Committee, arrangements were made for the manufacture of the new ridger at Jamshedpur. It is unfortunate that no reliable results could be obtained with cotton in 1929 as all the cotton plots on uniform land happened to be sown at right angles to instead of in the direction of the greatest slope. If these had been ridged, the run-off would have been prevented. A complete set of trials on cotton, however, has been arranged for in 1930. In the case of *juar* and *san* we were more fortunate and the following results were obtained which leave no doubt of the value of the new implement.

TABLE 3.—*Results of ridging experiments at Indore in* 1929.

Crop.	Yield per acre in maunds.		Difference in favour of ridging in maunds per acre.
	Ridged.	Flat.	
Sann (grown for seed) ..	7.09	3.73	3.36
Juar (grown for silage) ..	206.23	113.37	92.86
	141.46	95.70	45.76

Although it was not possible to obtain any accurate quantitative results on cotton in 1929, nevertheless very promising indications were obtained as to the value of the method on this crop. Ridging was found to act on cotton like a dressing of nitrogenous manure and to increase the growth. After the removal of the cotton crop, the general tilth was found to be markedly improved by ridging and there were far fewer weeds than when the crop is grown on the flat. The results also indicate that the use of the ridger on land in good condition may make the ratooning of cotton a practical proposition.

A great demand in Central India and Rajputana for the new implement has arisen. The cultivators have taken to it at once and the difficulty now is to obtain sufficient supplies from Jamshedpur to meet the indents. It promises to spread in rural India like the sewing machine.

The improvement of the variety.—The work outlined in the quinquennial report on the improvement and classification of Indian cottons made considerable progress during the year. A number of selections from the local Malvi crop have been raised from self-fertilised seed for five consecutive years and are now breeding true. A few of the most promising types are being grown on a field scale this year (for comparison and for the production of lint for testing) and a final selection will be made. A system of seed distribution in Malwa will be set in motion as soon as sufficient seed is available.

Now that a number of other pure lines of cotton are available, the work of improving the yield and ginning percentage of *bani* by means of hybridization has been taken in hand. *Bani* grows well as a rains crop at Indore but the yield of *kapas* as well as the low ginning percentage must both be materially improved before this variety can be brought to the notice of cultivators. The present programme is to improve the local mixed cottons of Malwa in two stages (1) by replacing the mixed crop by a pure line of

Malvi cotton characterised by a fair staple, a good yield and early maturity and (2) by replacing this pure line in turn by an improved *bani* obtained by hybridization with Malvi or *roseum*.

IV. Training.

The successful foundation of the Institute and the large number of practical results already obtained has been followed by visits from the Ruling Princes of Central India and Rajputana, by the Diwans of the Contributing States and that of many local notables. The question of how best to make use of the Institute in the training of the future leaders of the country-side is already being actively discussed. In this connection, a notable step has just been taken. At his own request, the new Maharajah of Indore, accompanied by his tutor, Mr. C. U. Wills, C.I.E., I.C.S., the Rural Development Commissioner, Rao Saheb S. L. Tambe and the Subha (Collector) of Indore attended last cold weather a course of about 24 lectures and demonstrations on the principles underlying rural development. These were given by the Director of the Institute. In his first public speech, His Highness laid stress on the fact that the future development of his villages and their lands will be the object of his special care. Already an important step has been taken in this direction. The position of the village patels has been improved with a view to having in each village an active agent in the work of rural development. Important steps are also in progress for giving the State an up-to-date revenue system which will at the same time protect the cultivator, safeguard the interests of the Darbar and also stimulate progress and ordered development. In a short time the work of introducing the results obtained at the Institute throughout the length and breadth of the Indore State will be set in motion.

Another important development is under discussion. The authorities of the Mayo College, Ajmere, are desirous of opening a branch of the Institute in the college compound which will serve both as a local centre for cotton work and also for interesting the future Rulers and the local notables of Rajputana in agricultural development.

There are other signs of progress to record. The type of candidate now coming forward for training and for employment on the Institute staff is very different from what it was. The sons of local notables, who are themselves large land-holders and who wield considerable influence, are asking to be trained. A number of these are now working in the Institute and are doing much better than the scholarship holders selected by the Committee. In addition to the ordinary staff, the Institute now possesses four training posts of its own on Rs. 100 per mensem, two in cotton agronomy, one in plant breeding and one in soil science. In addition, the Irwin studentship in cotton agronomy on Rs. 150 per mensem founded by Sir Sarupchandji Hukamchand of Indore, brings up the training posts to five, all of which have been placed on the temporary staff as this method has been found to give the best results.

The second annual cultivators' meeting.—The second annual cultivators' meeting, which commenced on November 11th, 1929, and lasted four days, was attended by over 500 selected cultivators and by about 30 officers from sixteen States in Central India and Rajputana. The visitors were accommodated in a large camp in the grove belonging to the neighbouring village of Piplia Hana. They were assisted and supervised by a contingent of selected boy scouts supplied by the Holkar State who also placed at the disposal of the Institute free of charge a large number of tents and *shamianas* as well as a contingent of the State fire brigade. The boy scouts and the fire brigade rendered police entirely unnecessary. As was expected, the comfort, convenience and friendly atmosphere of a camp set in rural surroundings made the visitors feel at home and instantly placed them in a condition to profit by the demonstrations and discussions. The mornings were given up to formal demonstrations followed by discussions. In the afternoons the cultivators saw things for themselves. In the evenings, a cinema was provided which proved very popular. Suitable films were very kindly lent by the Railway Board, by the Central Cotton Committee, by H. H. the Rana of Barwani and by Dewan Bahadur Sardar Pandit Narayan Prasad, Diwan of Dewas, S.B., a former member of the Board of Governors. The two latter also provided the machines which were operated by one of

the Institute students, Kumar Shiv Prasad. The general arrangement of the camp and the conduct of the cultivators' meeting as a whole was very ably organized by my personal assistant, Mr. M. L. Saksena. The meeting proved much more successful than was anticipated and a number of appreciative letters were received from the Contributing States. This gathering will now be made an annual event and steps are being taken to improve it in a number of ways, at the same time rigidly excluding everything in the nature of the miscellaneous exhibits and distractions associated with the ordinary agricultural show which do little more than confuse and bewilder the villager. The Indore meetings will be confined to a small number of well chosen and important improvements which can at once be taken up by any well-to-do cultivator. In the work of distributing new varieties of cotton and introducing simple improvements in cotton growing, these meetings are certain to prove of the very greatest value.

The training of cultivators.—A considerable demand for the service of cultivators trained at the Institute is growing up and steps are being taken to meet this by the annual dilution of the labour force with sufficient raw material of the right quality to enable the Institute to export at least 25 per cent. of its labour force every year. This export has begun and one noticeable result has already been obtained. A very good type of workman is now being recruited and it is now possible to weed out all inefficients and to replace them by real cultivators. In spite of the competition of the local mills and the demands of a large city, the Institute has now a really good labour force and the work is going forward with the requisite swing. During the last two years it has been possible to speed up the work and to reduce the hours of labour without any falling off in output. The beneficial results of the new system on both man and beast, particularly during the hot weather, are very striking. No difficulties are now experienced in starting work soon after sunrise and all now understand the health-giving properties of the early morning air and the advantage of rest during the hottest portion of the day.

V. Finance.

Audit.—It is not too much to say that the rapid expansion of the work of the Institute would not have been possible with the system of accounts and audit under which the Institute started and which greatly hampered its progress until July 1928 when the funds were transferred to the Imperial Bank, when payments were made by cheque and when the audit was carried out on the spot by a firm of Chartered Accountants. The new system has been in operation for two years and I trust that nothing will be done in the future to disturb it and to revert to the original procedure. Under the present system the work connected with accounts and audit proceeds with the greatest smoothness and celerity. On March 31st of each year, the accounts are closed. On the first working day of the new financial year, the statement of receipts and expenditure is prepared as well as the balance sheet of the trading account. A few days later these are placed before the auditors for examination and report. In establishing the new system of accounts and in the complete overhaul of the office, in which every vestige of red-tape has been swept away, I should like to bring to the notice of the subscribers of the Institute the good work done by the Head Clerk and Accountant, Mr. Abdul Shakoor, who has carried out his duties in a most thorough and efficient manner.

Appended are two audited statements (1) the receipts and expenditure of 1929-30 and (2) the balance sheet of the trading account for 1929-30, from which the financial position of the Institute can be ascertained.

(Sd.) A. Howard,

Director, Institute of Plant Industry, and Agricultural Adviser to States in Central India and Rajputana.

Indore, *June 14th*, 1930.

INSTITUTE OF PLANT INDUSTRY, INDORE.

CURRENT ACCOUNT

Dr. — *Cash Receipts and Payments for the year ended 31st March 1930.* — *Cr.*

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
To Opening balance		2,258 4 5	By Director's pay, leave salary, house allowance and provident fund ..	43,628 0 0	
,, *Contributions* :—			,, 2nd Imperial Economic Botanist's pay, leave and pension contribution	11,484 9 0	
From Indian Central Cotton Committee	1,15,000 0 0		,, Pay of staff, leave and pension contribution	37,611 10 0	
From Central India and Rajputana States	42,550 0 0		,, Provident fund of staff	728 5 2	
		1,57,550 0 0	,, Medical attendance	553 0 0	
,, *Donations* :—			,, Travelling expenses	3,943 4 9	
For H. E. Lord Irwin's Scholarship, from Sir Sarupchandji Hukamchand	4,000 0 0		,, Rent of land	300 0 0	
For the deputation expenses of the Second Imperial Economic Botanist, from Holkar State	2,500 0 0		,, Fire Insurance and protection :—		
		6,500 0 0	Rs. a. p.		
,, Sales of produce	9,963 2 11		Insurance Premia 539 14 0		
,, Miscellaneous receipts ..	2,575 11 3		Appliances, etc. 78 6 0		
,, Donations to Lending Library.	233 6 0			618 4 0	
		12,772 4 2	,, Audit fee	800 0 0	
			,, Farm working expenses 29,186 12 2		
			Non-recurring for culvert implements, tank etc. .. 2,169 5 6		
				31,356 1 8	
			,, Purchase and up-keep of machinery :—		
			Machinery 1,825 9 3		
			Maintenance 1,148 15 9		
				2,974 9 0	
			,, Laboratory apparatus and chemicals	5,546 6 0	
			,, Books and periodicals	3,473 5 1	
			,, Miscellaneous :—		
			Expenses 4,193 14 1		
			Furniture 747 12 0		
				4,941 10 1	
			,, Publications	1,799 12 3	
			,, Unforeseen and demonstration expenses	1,993 6 6	
			,, Irwin Scholarship Account	676 7 3	
					1,52,428 10 9
			,, 2nd Imperial Economic Botanist's deputation expenses		5,590 0 0
			,, Advance to Trading Account		5,000 0 0
			,, Cash and other balances :—		
			Cash in hand	715 4 1	
			With Imperial Bank of India, Indore, including set-aside for Sales Godown 4,000 0 0		
			Balance of H E. Lord Irwin Scholarship Account .. 3,323 8 9		
				15,346 9 9	
					16,061 13 10
Total ..		1,79,080 8 7	Total ..	....	1,79,080 8 7

Report of the Auditors.—We have examined the above statement of accounts of the Institute of Plant Industry, Indore. with the books and vouchers for the year ended 31st March 1930, and have obtained all the information and explanations we have required, and in our opinion the same is properly drawn up so as to exhibit a true and correct view of the financial affairs of the Institute for the year, as per the explanations given to us and as shown by the books of the Institute.

BOMBAY, 12*th May* 1930.

(Sd.) A. F. FERGUSON & Co.
Chartered Accountants.

INSTITUTE OF PLANT INDUSTRY, INDORE.

TRADING ACCOUNT.

Balance Sheet as at 31st March 1930.

LIABILITIES.	Rs. a. p.	Rs. a. p.	ASSETS.	Rs. a. p.	Rs. a. p.
Capital—			*Book Debts*—		
Advance from Current Account as per last Balance Sheet	5,000 0 0		Holkar State—Seeds Account..	0 6 6	
Additional advance received during the year	5,000 0 0		Holkar State — Publications Account	1 11 0	
			Bikaner State	60 0 0	
			Jaora State	208 12 0	
		10,000 0 0			270 13 6
Sundry Creditors—			*Sundry Debtors*—		
Holkar State—Balda Farm Account	4,049 0 0		Bills outstanding as per list ..		2,534 10 6
Rewa State	717 3 0		*Advances*—		
Narsingarh State	9 8 0		Against orders placed :—		
Edinburgh University ..	224 9 3		R. Hunt & Co., Ltd. (For chaff-cutters)		1,077 14 4
Students' Deposit	15 0 0		*Stock-in-trade*—		
		5,015 4 3	As per list certified by the Director at cost—		
Profit and Loss Account—			Publications	979 12 6	
Balance as per last Balance Sheet	462 2 1		Implements	5,627 8 8	
Add—Profit as per account (subject to proportionate establishment and other charges)	938 6 11				6,607 5 2
		1,400 9 0	*Cash*—		
			In hand	12 1 6	
			At Bank	5,913 0 3	
					5,925 1 9
	Total ..	16,415 13 3		Total ..	16,415 13 3

BOMBAY, *12th May* 1930.

We have examined the " Trading Account " Balance Sheet of the Institute of Plant Industry, Indore, as at 31st March 1930, and have obtained all the information and explanations we have required.

In our opinion, such Balance Sheet is properly drawn up and exhibits a true and correct view of the State of the Institute's affairs according to the best of our information and explanations given to us and as shown by the books of the Institute.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

APPENDIX III.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by mills in British India, and on Voluntary Returns from or Yarn Production figures of mills in Indian States).

Cotton year : 1st September to 31st August.

(IN BALES OF 400 lbs. NETT).

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021
Bombay Presidency..	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205
Central Provinces and Berar ..	94,635	106,052	109,995	111,292	116,888	121,391	123,146
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	98,829
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464
Rest of British India	12,227	14,414	17,313	13,190	15,040	22,189	24,458
Total—British India ..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,449
Total—Indian States ..	142,505	175,609	187,614	229,443	251,589	277,540	315,399
Total—India	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,372,848

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.

Cotton Year : 1st September to 31st August.

(IN BALES OF 400 LBS. NETT.)

	1926-27.	1927-28.	1928-29.	1929-30.
Hyderabad	15,210	16,697	19,067	20,823
Mysore	43,571	44,320	39,619	46,590
Baroda	46,070	46,884	48,852	59,043
Gwalior	24,257	25,716	36,708	41,463
Indore	53,526	65,391	76,070	83,026
Other Indian States	46,809	52,581	57,224	64,454
Total ..	229,443	251,589	277,540	315,399

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(IN BALES OF 400 LBS. NETT.)

	1926-27.	1927-28.	1928-29.	1929-30.
Bombay	28,328	24,970	27,324	24,361
Madras	35,198	39,560	52,188	46,582
United Provinces	16,991	10,308	13,878	20,441
Central Provinces and Berar	40,762	20,861	6,924	16,243
Punjab	3,910	4,739	3,760	4,361
Total ..	125,189	100,438	104,074	111,988

APPENDIX IV.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract.*—During the year 1929-30 the policy of the Agricultural Department to establish 1027 *A.L.F.* cotton over the whole of the tract south of the river Narbada was continued. Unfortunately, however, the absence of restrictions on the road transport of *kapas* across the river Tapti from the Olpad Taluka, where *Selection* 1-*A* is largely grown, has had most serious consequences during the year, as most of the Co-operative Societies in the tract south of the river Tapti have taken to the cultivation of *Selection* 1-*A*. The evil has become so widespread that even if the restrictions on the transport of *kapas* by road are re-imposed, it will be a long time before *Selection* 1-*A* can be ousted from the tract unless a cotton which combines the higher ginning percentage of 1-A with the lint qualities of 1027 *A.L.F.* can be introduced. Of the total area of 550,000 acres under cotton in Gujerat in the tract south of the river Narbada, it is estimated that about 450,000 acres are under 1027 *A.L.F.* and the rest under 1-*A* and other inferior types mainly grown in the Olpad Taluka and by most of the Co-operative Societies in the Chikhali, Bardoli and Chorasi Talukas.

An area of 12,717 acres of 1027 *A.L.F.* was grown under the control and supervision of the Agricultural Department, and the seed therefrom, amounting to over 2,500,000 lbs., was purchased and distributed in the tract south of the river Narbada, and in the States of Chhota Udepur and Rajpipla.

(2) *The Dholleras Tract.*—The improved variety of cotton now being introduced in this tract is *Wagad*-8 since the distribution of *Wagad*-4 was discontinued last year. Due to lack of rain, and intense heat in October and locust attacks, the multiplication of this variety was, during the year, greatly retarded. *Wagad*-8 now covers only 50 acres, but it may extend to 150 acres next year.

(3) *The Kumpta-Dharwar Tract.*—The work of introducing the three improved varieties of cotton, viz., selected *Kumpta* (*Dhawar No.* 1), *Upland* (*Gadag No.* 1) and New Cross (*Dharwar No.* 1 *x Rosea*), was carried out on lines similar to those in previous years in close co-operation with Cotton Sale Societies. For multiplying pure, pedigree seed, blocks of reserved areas were organized as usual to the extent of 4,580 acres under *Dharwar No.* 1 in villages round Hubli, 15,300 acres under *Gadag No.* 1 round Gadag and 1,990 acres under *Dharwar No.* 1 *x Rosea* round Bailhongal. The estimated yields of cotton from these three reserved areas were 1,100, 2,500 and 490 bales respectively. A separate seed multiplication block of 617 acres was organized at Haveri. The demand for pure seed of *Gadag No.* 1 is increasing and the reserved area under this had to be increased.

For the distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed-depôts were started as usual in different selected centres. The Gadag Dalals' Association also continued to stock pure seed. The total estimated area grown with pure seed was 59,800 acres under *Dharwar No.* I, 124,000 acres under *Gadag No. I* and 3,800 acres under *Dharwar No. I x Rosea* against 90,000, 1,39,000 and 6,000 acres respectively last year. The total estimated yields were 10,000, 15,500 and 600 bales against 15,000, 17,000 and 800 bales respectively last year. The slight fall in the area of *Gadag No. I* was due to unfavourable weather conditions at sowing time. Otherwise its popularity is increasing. In the case of *Dharwar No. I* the fall was mainly due to the policy of substituting the newly-evolved wilt-resistant *Dharwar No. I x Dharwar No. II cotton*. This cross was grown on a reserved area of 1,000 acres and the seed obtained is sufficient for a reserved area of 15,000 acres during the coming season.

Dharwar No. I x Dharwar No. II cotton, being as good as *Dharwar No. I* in quality and whiter in colour, fetched a better price than *Dharwar No. I* cotton and it was named in a public auction sale as *Jayawant* cotton meaning "success." "*Dharwar No. I x Rosea* cotton round Bailhongal is not gaining ground, as it is observed to be later than *Kumpta* and susceptible to wilt. Some cultivators whose fields are not affected by wilt

are keen on growing it, as it gins high and fetches a better price than *Kumpta*. Trials for another year will decide its fate. A cross between (*Dharwar No. I x Rosea*) *x Dharwar No. II* is observed to be as good as *Dharwar No. I x Rosea* and wilt-resistant. It is still under observation at the breeding station.

All these improved types of cottons have continued to be appreciated by buyers who gave on an average Rs. 15 more per *Naga* of seed cotton (1,344 lbs.) for *Dharwar No. I*, Rs. 35 more for *Gadag No. I* and Rs. 36 for *Dharwar No. I x Rosea* cross cotton in auction sales held during the year at Hubli, Gadag and Bailhongal respectively. *Jayawant* cotton got a better price than even *Dharwar No. I* cotton in the auction sale held at Hubli.

The Indian Central Cotton Committee has recently come forward to help the extension of *Jayawant* cotton round Hubli and *Gadag No. I* cotton round Gadag. With the resources of the Sale Societies, it was only possible up till now to organize a reserved area of 5,000 acres for *Dharwar NI. I* round Hubli and 7,500 acres for *Gadag No. I* round Gadag and stock pure seed raised there sufficient for about 75,000 acres in each case. With the help of the Indian Central Cotton Committee, it has now been decided to organize a reserved area of 15,000 acres for *Jayawant* cotton round Hubli and 22,000 acres for *Gadag No. I* round Gadag and raise pure seed sufficient for about two lacs acres in each case.

(4) *The Khandesh Tract.*—The cultivation of *Banilla* cotton, which was known as *Dhulia No. I* up till now, was continued in four talukas. Though arrangements were made to grow in four talukas only it has naturally spread in more talukas. The distribution of seed of *Banilla* cotton was in selected areas. The total area in this Division was estimated at 30,000 acres in the year 1929-30. Out of this nearly 8,000 acres were kept under the supervision of the Department as well as of Taluka Development Associations for purification and for the supply of pure seed. The total output of *Banilla* cotton was 7,000 bales. The average yield of *Banilla* cotton over an area of 7,600 acres was 325 lbs. of *kapas* per acre while the ginning percentage varied from 38 to 40. It fetched a premium of Rs. 25 to 30 per candy over the local cotton. The buyers purchased it willingly and most of it was purchased by the local mills, leaving a very small portion for outside mills.

MADRAS.—I. *The Southern Tract.*—(A) *Cambodia—Coimbatore.*

General.—The multiplication of the improved varieties of *Cambodia* cotton began in 1918-19. Under annual contracts, the Agricultural Department supplies the improved seeds to the selected cultivators and advances to them about Rs. 15 per acre towards the cost of intercultural operations and recovers the seed at the end of the season. The cultivators sow the seed supplied by the Department on " seed farms " and the operation is supervised by the Department. These cultivators form among themselves non-credit seed societies. There are 12 such societies at present belonging to the Avanashi Union and 4 to the Tirupur Union. All the *kapas* produced is handed over to the Agricultural Department for ginning. The lint is sold by the Department in public auction on behalf of the *ryots*, and the seed is bought by the Department at a premium of Rs. 2 per *pothi* of 250 lbs. and distributed again among cultivators for extending the improved varieties. This system was slightly modified during the year under review. The Agricultural Department purchased only the seed obtained from hand-picked season's *kapas*, and the cultivators were allowed to make their own arrangements for ginning the *kapas*. But necessary help is given to them in the disposal of their lint.

(*i*) Eight seed societies at the Avanashi centre with an area of 850 acres were transferred to the control of the Co-operative Department during the year with a special Agricultural Demonstrator in charge. The transfer was a relief to the Department and 16 new seed farms were organized for an additional area of 165 acres. The four old seed societies at the Tirupur centre cultivating an area of 447 acres continue to be under the supervision of the Agricultural Department. Thus the total area under (*Co.* 2) seed farms was 1,462 acres against 1,126 acres in the previous year. Advances for

cultivation expenses were made only for the seed farm areas under the control of the Agricultural Department. The seed farms yielded on the average 442 lbs. of *kapas* per acre under first picking against the normal of 750 lbs. as the crop was sown a fortnight late and suffered from drought up to March. The total area cultivated with farm seeds is estimated at 26,050 acres under *Co.* 1 and 1,512 acres under *Co.* 2. Altogether 293,874 lbs. of improved seed were available for distribution among the growers of cotton for further production. Of this quantity 238,086 lbs. was sown in the Coimbatore District and 7,000 lbs. in other districts. By the expansion of the seed farms, it is hoped that greater quantity of good seeds will be made available for cultivators and that eventually high quality of the lint will become a common factor of the country.

(*ii*) 311 candies of *Cambodia* lint were sold on behalf of the seed farm *ryots* at a premium of Rs. 12 to Rs. 15 per candy above the market rate.

(*iii*) *Co-operative ginning.*—A few *ryots* in the talukas of Pollachi and Gobichettipalayam ginned their *kapas* with departmental assistance and reserved 110,000 lbs. of good *Co.* 1 seed for sowing.

Cambodia—Trichinopoly.—In the Trichinopoly District also, *ryots* used 48,774 lbs. of *Cambodia* seed made up of 29,774 lbs. supplied by the departmentf rom Coimbatore, 12,000 lbs. of seed supplied by two traders from the Tiruppur tract and 7,000 lbs. distributed by two gin-owners from good *kapas* purchased by them through the Department. The area was, however, less than that of last year by about 730 acres.

Cambodia-Madura.—The area under seed farms (*Co.* 1 *and Co.* 2) in the taluks of Dindigul, Palni, and Periyakulam was 150 acres. The crop was adversely affected by the heavy rains of November and also suffered from insect attack and fungoid diseases. The yield was therefore only 420 lbs. of *kapas* from the first picking. 21,570 lbs. of seed were distributed among *ryots* against 19,900 lbs. last year. The total area under improved strains of *Cambodia* is estimated at 4,529 acres.

(B) *Karunganni—Coimbatore.*— *Karunganni* cotton is making headway in the dry lands of Coimbatore District and is displacing dry *Cambodia* and *Uppam*. This strain also is being propagated in seed farm areas under contract with selected *ryots* as in the case of *Cambodia*, with a smaller advance for intercultivation, viz., Rs. 10 per acre. An average yield of only 189 lbs. *kapas* per acre was obtained from the seed farm area of 741 acres grown by 45 *ryots* in 22 villages mainly in the Udumalpet taluk against 203 lbs. in the previous year. The low yield was due to drought. 81,755 lbs. of seed available from the seed farms of 1928-29 were purchased by the Department at a premium of Rs. 2 per *pothi*. 76,312 lbs. were distributed among cultivators for sowing against 128,545 lbs. in 1928-29.

Karunganni—South.—The multiplication of the seed *C.* 7 and *A.* 10 on seed farms and production and sale of lint through agencies like seed unions and co-operative societies were continued without the intervention of the Agricultural Department. The area under seed farms fell from 1,005 acres to 896 acres (548 acres under *A.*10 and 348 acres under *C.* 7) in the year under review. An advance of Rs. 5 per acre was given to the seed farm *ryots* for cultivation expenses. Owing to the unfavourable season, the average yield per acre was only 196 lbs. of *kapas* which is however noted as satisfactory as compared with 100 lbs. obtained in the previous year. 110,012 lbs. of seed were obtained from the seed farms of 1928-29 at a premium of Rs. 2 per *pothi* and sold to *ryots* for sowing. Departmental strains in varying degrees of purity are now universal throughout the south and pure *Uppam* seeds, formerly sown in the Ramnad District, are used only in mixtures with *Karunganni*.

II. *The Northern and Western Tract.*— (*a*) *Northerns.*— *N.* 14 is the important strain for the locality though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. It was grown on 1,649 acres round about Nandyal and Allagadda under seed farm conditions against 2,200 acres in the previous year. The quantity of the farm seed distributed for sowing was 92,152 lbs.

The total area cultivated was 27,273 acres, i.e., 3,672 acres more than the area of 23,601 acres brought under cultivation in the previous year. The estimated production of *kapas* was 190 lbs. per acre in the seed farms and 200 lbs. in *ryots'* fields, the corresponding figures for the previous year having been 156 and 150 lbs. respectively. The Department assisted the seed farm *ryots* and other cultivators who grow the strain in ginning their *kapas* and selling the lint jointly. Messrs. Binny & Co. purchased it through the Agricultural Department at a premium of Rs. 40 to Rs. 45 per *candy* of 500 lbs. against about Rs. 32 for the lint offered directly by the cultivators.

(*b*) *Westerns*—(*i*) *H*-1 *strain.*—This is a new strain which has been evolved by the Hagari Experiment station in the Bellary District. It has proved its superiority over *H*-25 in the matter of yield and ginning percentage and is equal to it in the quality of lint. The area under seed farms was 7,576 acres and the quantity of seed obtained was 370,272 lbs. The total area sown was 160,285 acres against 48,622 acres in the previous year. The estimated production of *kapas* ranged from 125 to 200 lbs. per acre. The Department assisted the *ryots* in ginning their *kapas* and selling the lint jointly. 977 bales of lint were sold at a premium of Rs. 14 to Rs. 24 per bale of 400 lbs.

(*ii*) The chief exporting firms continue to sell on types prepared by their own admixture of different varieties (high and low) as the outcome of trade competition and this practice continues to act as a brake on the improvement of cotton in the tract. The quality of cotton is bound to improve much more quickly if the exporting firms could be induced to sell the commodity pure and to advertise the local names of cotton instead of their type numbers. The *ryots* would then learn to grow the best variety of cotton and to market it pure for sale.

UNITED PROVINCES.—The introduction of improved varieties of cotton continues to make satisfactory progress. The distribution of *A*. 19 is being continued on the lines of previous years and the area is expanding rapidly. Indents are received from all parts of the United Provinces. This cotton has also done well in Rajputana and the area there too is increasing rapidly. As the variety does very well even in unirrigated areas the demand from such tracts is increasing. Gwalior State has this year purchased about 300 maunds of seed of this variety for distribution to the cultivators there. The total seed of *A*. 19 distributed in the year 1929-30 from the departmental as well as private stores was 3,125 *maunds.*

The new cotton *C*. 402 which is capable of spinning yarn of 18-22 counts was grown at different centres in the United Provinces, notably in the new area opened for irrigation by the Sarda Canal. 200 *maunds* of seed of this cotton were distributed in the year 1929-30 covering an area of about 1,000 acres. Cotton from certain places was purchased from an advance made by Government for that purpose. After paying all charges in connection with collecting, ginning, baling, etc., the transaction resulted in a net profit, a portion of which only was distributed among the cotton growers by way of encouragement to introduce this valuable cotton in these parts which ordinarily grow strains capable of spinning 6-8 only. 149 bales of *C*. 402 were sold at prices ranging from Rs. 315 to Rs. 323 per *candy* on dates when *Broach* was selling at Rs. 288 and Rs. 278 at Cawnpore.

Seeds of *C*. 402 were supplied for trial to Gwalior and Indore States and to the Consul for Japan at Bombay.

C. 520 cotton is a newly improved form of *Roseum*, producing early and heavy crop with a distinct improvement in the quality of fibre which is fit for spinning a yarn of 10-12 counts against 6-8 which *Roseum* is ordinarily capable of giving. 74 *maunds* of seed of this type were distributed, covering an area of about 375 acres, chiefly in the Western parts of the Province. The seed of this cotton is being issued with certain reservation, because it is preferred by the cultivators owing to its outturn and earliness over *C*. 402. It is lower than *C*. 402 in spinning value which the Department is anxious to push forward owing to its superior quality of lint.

C. 1031 is another strain which gives a very clean and high ginning cotton. The size of the boll is very large in comparison with other local strains. The ginning percentage is invariably above 40. Seeds of this are being given in certain areas where the cultivators like it, notably around Fatehpur District.

THE PUNJAB.—The total area under American cotton was reported in the final Cotton Forecast to be 825,100 acres as compared with 960,800 acres in the preceding year. Of this area 4-*F* was grown on 763,273 acres.

289*F*, a later selection, was reported to have been grown on 4,552 acres.

As a result of the continued work at Lyallpur on the selection of types of American cotton an early strain has been evolved which will be further tested before it is given out to farmers.

Most valuable climatological data have been obtained which, it is hoped, will materially assist in the solution of the periodical partial failures which have occurred in the Punjab-American cotton crop.

Work on indigenous cottons is being continued. The area under *G. indicum Mollisoni* selection in 1929-30 was 185,818 acres as compared with 368,587 acres in 1928-29. The area under *G. neglectum* variety *Roseum* selection of *desi* cotton, which is grown in the south-east, was reported to be 102,747 acres. The total area under *desi* cotton for the year 1929-30 was 1,343,900 acres as compared with 1,531,900 acres.

CENTRAL PROVINCES AND BERAR.—The chief result obtained from the cotton experiments was the confirmation of the results obtained the previous season, demonstrating the complete superiority of the improved wilt-resistant cotton—*Verum* 262 strain—over all other types of cotton tried. The area under it in the main cotton growing tracts is extending very rapidly. Benefiting by the successful experiment of the last year, co-operative ginning and selling were again resorted to in order to secure a proper premium for the superior lint of this strain, by offering to the buyer a quantity of bales of uniform quality. This method of doing business has proved highly satisfactory and encouraging for the cultivator. The total output of lint as estimated from the pool ginning results was some 6,590 bales. These were sold without any difficulty, mostly to the local mills, at an average premium of Rs. 30 to Rs. 34 over the ruling prices of Broach. About 95 bales of lint of this strain, the produce of the Akola and other Government farms, were despatched to Liverpool as an experimental consignment for practical tests for spinning and weaving and have been reported upon very favourably.

Special arrangements for the extension of area under this cotton in the near future have been made.

It is hoped to develop a somewhat later strain of *Verum* for areas which are subject to late September rains.

BURMA.—*Myingyan Circle.*—Due to unfavourable seasonal conditions not only the total area under *Pwinbyu Wagale* cotton was reduced to 4,000 acres, but also the total yield from the successful area was seriously affected. The *kapas* produced amounted to 119,413 *viss* only and sufficient seed of this strain to sow 5,000 acres only could be distributed during the year.

The progress is decidedly slow, and it is difficult to spread an improved cotton under existing conditions in the dry zone. While the average yield is low and the seed rate for broadcasted sowings relatively high, unfavourable weather conditions often prevail and give the cotton crop a set-back from which it can hardly recover. While attempts are being continued to spread the *Pwinbyu Wagale*, it is considered that the best way of overcoming the above difficulties is to concentrate for a time on better cultural methods which will increase yields, reduce seed rates and put the growers in a position to benefit from organizations for the sale of produce. A definite scheme is therefore being drawn

up for this purpose with the idea of requesting the Indian Central Cotton Committee to finance it for a period of five years.

The Department's re-selected strain *C.*19 ginned 43 per cent. of lint against the normal outturn of 32 per cent. for the unselected crop. This strain was multiplied on an area of 88 acres and in spite of the unfavourable season averaged 334 lbs. of seed cotton to an acre. Sufficient seed to sow an area of 300 acres during the coming year was distributed.

The hybrid strains which have been retained from the crosses made in 1924 show considerable promise, particularly in respect of bolling qualities and staple length. The best of them will be subjected to a preliminary yield test in the coming year. Thirteen reciprocal crosses made in 1928 have been carried through for a study of the segregation of characters in the F2 generation and a series of new crosses have also been made with a view to a more desirable combination of characters.

West Central Circle.—Selection work with *Wagyi* and *Wagale* cotton at Allanmyo was continued and twenty-one selections of *Wagyi* and twenty of *Wagale* were under trial on a field scale.

The crosses between *Wagyi*, *Wagale* and *Broach* which were made last year were under study.

Cambodia cotton continues to be cultivated in small areas in Thayetmyo and Minbu Districts.

HYDERABAD STATE.—H. E. H. the Nizam's Government are making wide efforts to rehabilitate the reputation of the Hyderabad *Gaorani* (*Moglai*) cotton. The Hyderabad Cotton Cultivation and Transport Act is a great stride forward in this direction, as under this Act, not only the importation of inferior cotton into a protected area can be prohibited, but also the cultivation in that area of any variety other than the approved one can be penalized. Fully supported by such legislation, the Agricultural Department is now striving hard to eradicate the inferior white-flowered *Neglectum Roseum* cotton from a protected zone comprising the districts of Nander, Bidar and parts of Bhir and Oosmanabad and the Nirmal Taluka of Adilabad District and to establish in its place the superior yellow-flowered *bani* cotton for which that tract was once very famous. This is now being accomplished in two ways. In the first place, large quantities of the famous *Umri* cotton seed are purchased by the Department outright and distributed to the cotton growers in the protected zone from seven seed depots located in suitable centres. Last year 3,400,000 lbs. of cotton seed were thus purchased and given to cultivators on *Takkavi* loan system and the area sown with this seed was about 2¼ lakhs acres. The second method consists in roguing out all white-flowered plants from an area of 1,500 acres in the village of Bhaisa in the Nander District where it has been found that the quality of *Gaorani* is very good and almost pure, and the superior seed thus obtained is being distributed for sowing in other villages.

BARODA STATE.—The general policy of the State Agricultural Department is to follow the advice of the Bombay Department of Agriculture, as far as is practicable.

Baroda District.—The area of *Broach* 9-1 cotton in this district was 7,617 acres. The growing of this cotton is, however, in the experimental stage. The percentage of wilt in this variety is about the same as in *deshi* cotton.

In the Sankheda Taluka, which borders the Chhota Udepur State, 1027 *A.L.F.* cotton was grown on 2,649 acres.

Navsari District.—No special depots were opened for the distribution of 1027 *A.L.F.* cotton seed but seed was distributed by the cultivators amongst themselves. The following

figures will give some idea of the amount of seed of this variety, distributed in the various cotton areas of the Baroda State :—

Area.	*Pounds Seed.*
Gandevi	8,000
Navsari	30,000
Palsana	20,000
Mahuwa	10,000
Kamrej	12,000
Songadh and Vyara	10,000
Mangrol..	60,000
Total seed distributed ..	150,000

Amreli District.—A society for the distribution of pure *Khandesh* cotton seed, an improved variety of the local *Malwa* cotton, was started through the efforts of Mr. Bhate, the then Suba of Amreli. This society distributed 1,640 pounds of seed.

Kadi District.—The Government sanctioned Rs. 2,500 for opening pure cotton seed depots in this district. Accordingly 54,680 lbs. of cotton seed was purchased and sold through 15 centres to the cultivators at a lower price, the Government and the Panchayet equally suffering the loss. The cotton sown in this district is of *Wagad* type ; 1027 *A.L.F.* was also introduced this year.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, by the Cotton Transport Act and by the control of ginning and pressing factories. This year as the crop in the Surat and Navsari Districts was late and affected with frost, the State considered it more advisable instead of going in for the purchase of *Surat* and *Navsari* seed, to arrange locally to preserve the seed of cotton picked before the frost. The cultivators were provided with this seed, the quality of which was exceedingly good. The cultivators reaped a bumper harvest so much so that in parts the outturn of cotton by far exceeded their fondest expectations and there being always a great rush for the purchase of cotton of this State, the condition of the agriculturists financially would have been highly satisfactory and sound had it not been for the fact that the prices of cotton ruling in the market this year were generally low.

As usual, the State arranged to obtain the best seed of the improved strain of 1027 *A.L.F.* variety for the next season and the experienced Thandar of Valia was deputed to Surat with some leading cultivators of the State to select and purchase the seed under the advice and guidance of the Cotton Superintendent. The best seed thus secured was distributed among the cultivators by the State.

Rajpipla cotton is now recognized as equal to the very best type of *Surat* cotton and is eagerly sought after.

MYSORE STATE.—I. *Deshi cotton.*—Amongst *deshi* cottons, the most important is (1) "*Kumpta* cotton" (*G. herbaceum*), cultivated in Chitaldroog and Shimoga Districts on black soils. This cotton has a staple which measures ⅞ inch and gives a ginning outturn of 25 per cent. As a result of selection, two types have been isolated which have proved superior to the local cotton, one of which, *Selection* 69, has been grown over 15,000 acres. It has a ginning percentage of 29 and the lint is very much appreciated in the cotton market of Hubli.

(2) *Nadam cotton* (*G. obtusifolium*) and black seeded *Sannahatti* (G. herbaceum var. Melanosperma) are also grown on small areas in other parts of the State.

(3) As a result of hybridisation between *G. arboreum* and *G. herbaceum*, a strain of cotton has been evolved which has a staple of fully one inch and gives a ginning outturn of 29 per cent. It is being tested under field conditions.

II. *Upland cotton.—Doddahatti.—Dharwar-American* cotton (*G. hirsutum*) is grown round about Banavar in the Hassan District. It has a reputation in the Bombay market. A good deal of breeding work has been carried on for several years both by selection and by hybridisation. Some of the strains evolved are very promising and they possess good staple and give good ginning outturn . They are at present being tested under field conditions where *Dharwar-American* is largely grown.

APPENDIX V.

BALANCE SHEET AS ON 31ST MARCH 1930.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		67,15,165 3 0	I. Administration		9,31,619 5 0
			(*b*) Improvement of Cotton Marketing ..		65,744 14 1
INTEREST ACCOUNT.			II. *Technological Research.*		
			(1) Technological Laboratory.		
Amount received on investments and fixed deposits..	7,26,962 2 1		(*a*) Capital Expenditure.		
Add :—Refunds of income-tax deducted on interest..	9,698 1 0		(i) Lands and Buildings ..	3,55,797 9 11	
	7,36,660 3 1		(ii) Machinery	78,385 0 3	
Rs. a. p.			(iii) Freight	7,502 2 8	
Less :—(1) Interest paid in advance at the time of purchasing Govt. paper —since recovered—and bank's commission on interest collection.. 37,957 5 0			(iv) Apparatus and Equipment.	41,558 3 7	
(2) Income-tax deducted on interest on Govt. paper (recoverable) .. 13,373 1 6			(v) Machinery Workshop ..	5,789 8 3	
(3) Interest credited to Committee's Provident Fund Account 4,886 6 2			(*b*) Working Expenses	7,48,491 7 0	
(4) Bank's withdrawal charges for Tax-free securities sold 1,690 8 0			(2) Provincial	11,166 4 0	
(5) Provision for Sinking Fund .. 848 9 0					12,48,690 3 8
	58,755 13 8		III. Research Studentships		1,72,838 14 3
			AGRICULTURAL RESEARCH GRANTS.		
			IV. Bombay	4,26,883 7 9	
			V. Madras—Herbaceum	67,895 14 11	
			,, Pempheres and Physiological ..	2,137 8 7	
			VI. Punjab—Botanical	2,50,122 1 5	
			,, Entomological	64,139 11 4	
		6,77,904 5 5	VII. Central Provinces	1,82,013 11 2	
Profit on conversion of 6 per cent. 1926 Bonds into 5 per cent. 1935 Taxable Loan		5,000 0 0	VIII. United Provinces	1,15,402 5 0	
Miscellaneous Receipts		8,833 9 5	IX. Institute of Plant Industry, Indore ..	8,29,676 12 0	
Sinking Fund		848 9 0	X. Sind	61,715 7 1	
SUSPENSE RECEIPT.			XI. Burma	2,906 15 5	
			XII. Hyderabad	19,600 0 0	
					20,22,493 14 8
Amount payable to the Trustees to the Indian Central Cotton Committee Provident Fund for Committee's contribution for the year ended 31st March 1930 ..		12,138 10 0	Suspense Account		758 14 1
			Investments and Cash Balances		*29,77,744 3 1
Grand Total ..		74,19,890 4 10	Grand Total ..		74,19,890 4 10

* This includes Rs. 12,138-10-0 of Provident Fund Account and Rs. 848-9-0 against Sinking Fund.

BALANCE SHEET AS AT 31ST MARCH 1930.

Provident Fund Account.

RECEIPTS.						EXPENDITURE AND INVESTMENTS.			
	Rs.	a.	p.	Rs.	a. p.		Rs.	a.	p.
Subscribers' Contributions Account	51,107	14	11			By expenditure for stationery, transfer fees and registration charges for Power of Attorney given to the Imperial Bank of India by the Trustees	108	5	0
Committee's Contributions Account	49,823	1	10			Accrued interest paid to the subscribers on Government Paper up to 31st March 1930 ..	1,143	10	0
Recoveries against advances ..	4,013	10	0			*Investments in Government Paper.*—			
	1,04,944	10	9			Cost of 3½% G. P. Notes of Rs. 73,200 ..	51,730	7	1
Less:—						Cost of 6% Taxable Loan 1930 Rs. 4,000 ..	4,061	4	0
(1) Refunds to subscribers resigned	2,973	13	0			Cost of 6% Taxable Loan 1931, Rs. 15,500	15,901	14	0
(2) Advances	6,333	2	0			Cost of 5% 1939-44 Taxable Loan of Rs. 10,800	10,360	9	6
	9,306	15	0			Balance in Current Account with the Imperial Bank of India, Bombay	193	0	2
				95,637	11 9	Amount due from the Committee for contributions to the Fund for the year ending 31st March 1930	12,138	10	0
Total ..				95,637	11 9	Total ..	95,637	11	9

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH 1930.

RECEIPTS.	Rs. a. p.	Rs. a. p.
Opening Balance ..	27,39,959 1 8	
Less.—Payments made to the Trustees, Committee's Provident Fund	11,927 6 11	27,28,031 10 9
Receipts under Section 12 of the Indian Cotton Cess Act, 1923		7,60,078 13 3
*Other Receipts		14,644 2 4
nterest on Investments		1,32,126 9 0
Total ..		36,34,881 3 4

EXPENDITURE.			Rs. a. p.	Rs. a. p.
I.	Administration of the Committee (including Improvement of Cotton Marketing)			1,31,432 9 11
II.	Agricultural Research Grants-in-Aid			3,72,879 1 9
III.	Technological Research			1,52,066 6 6
IV.	Closing Balance—			
	(Government Paper at cost).	*Face Value.*		
	3½% Government Promissory Notes	Rs. 7,56,300 ..	5,39,864 6 5	
	5% Ten Year Bonds, 1935	„ 2,75,000 ..	2,40,032 13 0	
	5% Indian War Loan, 1929-47	„ 7,88,000 ..	7,65,220 12 10	
	4½% Government of India Loan, 1955-60 ..	„ 26,600 ..	23,004 0 0	
	5% Government of India Loan, 1939-44	„ 3,09,000 ..	2,96,679 13 6	
	†% Bombay Municipal Debentures, 1954.. ..	„ 50,000 ..	56,500 0 0	
	6% Rangoon Municipal Loan, 1955	„ 3,83,500 ..	4,15,328 2 0	
	6% Karachi Port Trust Loan, 1956	„ 1,30,000 ..	1,41,212 8 0	
	3 Months Government Treasury Bills	„ 25,000 ..	24,625 0 0	
	4½% India Sterling Stock 1950-55 Bearer ..	£ 16,000 ..	1,95,621 14 4	
	4½% India Sterling Stock 1958-68 Bearer ..	£ 8,000 ..	93,762 12 6	
	3½% India Sterling Loan 1931 Bearer	£ 16,000 ..	1,28,579 12 8	
	Fixed and Call Deposits (with approved Banks)		43,500 0 0	
	Imperial Bank of India, Ltd., Current Account		9,312 3 10	
	Imprest—Committee's Account as certified by the Secretary	1,500 0 0		
	Technological Laboratory as certified by the D. T. L.	500 0 0		
	Cotton Research Botanist, Punjab, as certified by the Cotton Research Botanist, Punjab	500 0 0		
			2,500 0 0	
	Suspense (Recoverable)		758 14 1	
	‡Total Closing Balance ..			29,78,503 1 2
	Total ..			36,34,881 3 4

* This amount includes Rs. 12,138-10-0 on account of Committee's contribution to Provident Fund Account for the year 1929-30 and Rs. 848-9-0 on account of Sinking Fund against Redemption of Investments in Gilt-edged Securities.

† Deposited with the Imperial Bank of India, Ltd., for security against any overdraft that may be required by the Committee.

‡This amount includes Rs. 12,138-10-0 on account of Provident Fund and Rs. 848-9-0 against Sinking Fund.

We have examined the above Statement of Receipts and Expenditure of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required, and certify that to the best of our information and explanations received, the above Statement is a correct abstract of the figures appearing in the books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, *28th April* 1930.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors.

PROVIDENT FUND ACCOUNT AS ON 31ST MARCH 1930.

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1929	69,644 12 3		By Balance :—		
Less—Interest paid to Subscribers, accrued up to 31st March 1929	737 10 0	68,907 2 3	(Government Paper at cost). *Face Value.*		
	Rs. a. p.		3½% Government P. Notes .. Rs. 73,200 ..	51,730 7 1	
To Subscribers' Contributions ..	12,138 10 0		5% Taxable Loan 1939-44 .. „ 10,800 ..	10,360 9 6	
Less—Refunds to Subscribers	155 13 0		6% Ten-year Bonds 1930 .. „ 4,000 ..	4,061 4 0	
	11,982 13 0		6% Ten-year Bonds 1931 .. „ 15,500 ..	15,901 14 0	
Add—Recoveries against advances ..	1,592 6 0				
	13,575 3 0		Balance in Imperial Bank of India, Ltd., Current Account	193 0 2	
Less—Advances to Subscribers	3,528 2 0	10,047 1 0			82,247 2
To Interest received on investments ..	3,889 0 0		By Amount due from the Indian Central Cotton Committee for the Committee's contribution as on 31st March 1930		12,138 10 0
Interest received on advances to subscribers	15 3 7				
	3,904 3 7				
Less—Interest paid to Subscribers who have resigned during the year ..	7 2 8				
Advance interest paid for securities purchased, and since recovered ..	183 3 5				
Income-Tax deducted from Interest ..	254 12 0				
Bank's Commission for collection of interest	10 5 0				
	455 7 1				
To Committee's Contribution due from the Indian Central Cotton Committee @ 100%	12,138 10 0	3,448 12 6			
Less—Amount paid to Subscribers who have resigned ..	155 13 0				
		11,982 13 0			
Total ..		94,385 12 9	Total ..		94,385 12 9

Examined and found correct.

(Sd.) S. B. BILLIMORIA & Co.,

Bombay, 28th April 1930.

Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH SCHEMES UP TO 31ST MARCH 1930.

Major Heads.	Total Sanctioned grant.	Period.	Date of starting of work.	Total Expenditure up to 31st March 1930.	Expenditure from Capital Grant on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field, experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and buildings.	(*b*) Machinery and apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
II. *Technological Research.*	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(1) *Technological Laboratory.*									
(*a*) Capital Expenditure	5,04,799 3 8	Permanent.	1923.	12,48,690 3 8	3,55,797 9 11	1,33,234 14 9	....	....	*Cotton Breeding Scheme closed down in July 1929.
(*b*) Working Expenses	7,48,491 7 0		Jan. 1924.		....	....	21,061 8 11	7,27,429 14 1	
(2) Provincial	11,166 4 0		April 1928.		....	....	....	11,166 4 0	
AGRICULTURAL RESEARCH GRANTS:									
IV. *Bombay Schemes.*									†Rs. 1,400 transferred to Capital from working grant.
(1) Surat Physiological	2,91,445 0 0	10 years.	Sept. 1923.	1,65,944 14 7	....	....	17,639 10 5	1,48,305 4 2	
(2) Surat Boll-worm	1,13,670 0 0	7 years.		1,02,735 6 0	....	....	5,768 9 0	96,966 13 0	
(3) Dharwar Wilt and Cotton Breeding*	2,63,545 0 0	10 years.		1,41,250 9 2	....	....	13,544 2 0	1,27,706 7 2	‡ The balance of this, amounting to Rs. 3,100-13-5 lapsed on revision of scheme.
(4) Khandesh Cotton Breeding	25,000 0 0	5 years.	Oct. 1926.	16,769 6 0	....	....	....	16,769 6 0	
(5) Co-ordination of Cotton Research	98,655 0 0	5 years.	Not started.	183 4 0	....	....	....	183 4 0	
V. *Madras Schemes.*									||Rs. 50,202-12-10 transferred from Recurring grant to Capital.
(1) Herbaceum	72,985 0 0	7 years.	Decr. 1923.	67,895 14 11	....	....	3,232 1 9	64,663 13 2	
(2) Pempheres and Physiologieal	2,75,000 0 0	5 years.	Not started.	2,137 8 7	....	....	....	2,137 8 7	
VI. *Punjab Schemes.*									¶Figures for 1929-30 taken from budget estimates and subject to revision on receipt of Annual Returns.
(1) Botanical.									
(*a*) Capital Expenditure	†30,700 0 0	5 years.	Aug. 1925.	2,50,122 1 5	21,597 5 0	9,102 11 0	....	....	
(*b*) Working Expenses	†2,23,600 0 0	5 years.			....	....	¶12,280 1 9	2,07,141 15 8	
(2) Entomological.									
(*a*) Capital Expenditure	6,000 0 0	5 years.	May 1926.	64,139 11 4	....	5,826 3 10	....	....	
(*b*) Working Expenses	85,000 0 0				....	....	¶2,658 9 0	55,654 14 6	
VII. *Central Provinces*	†61,000 0 0	2½ years.	Oct. 1923.	1,82,013 11 2	....	....	10,359 5 4	1,71,654 5 10	
	3,22,165 0 0	8 years.	April 1926.						
VIII. *United Provinces.*									
Pink Boll-worm Scheme.—									
(*a*) Capital Expenditure.	54,000 0 0	..	..	1,15,402 5 0	....	48,011 9 3	....	....	
(*b*) Working Expenses	56,000 0 0	5 years.	April 1925.		....	....	3,138 6 9	64,252 5 0	
(*c*) Recurring grant for staff	25,200 0 0	..	Oct. 1926.		....	....	....		
IX. *Institute of Plant Industry, Indore.*									
(*a*) Capital Expenditure	||2,83,536 11 9	Permanent.	Oct. 1924.	8,29,676 12 0	2,12,552 11 5	70,984 0 4	....	....	
(*b*) Working Expenses	||4,31,140 0 3				....	....	31,857 4 4	5,14,282 11 11	
X. Sind	1,00,000 0 0	5 years.	July 1927.	61,715 7 1	....	....	6,154 13 7	55,560 9 6	
XI. Burma—Capital	3,000 0 0	..	..	2,906 15 5	....	2,906 15 5	....	....	
XII. Hyderabad	1,22,500 0 0	5 years.	May 1929.	19,600 0 0	....	....	¶3,200 0 0	16,400 0 0	
Total	..	..	..	32,71,184 2 4	5,89,947 10 4	2,70,066 6 7	1,30,894 8 10	22,80,275 8 7	

APPENDIX VI.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930.

TECHNOLOGICAL LABORATORY, BOMBAY.

1.	Director, Technological Laboratory ..	Dr. A James Turner, M.A. (Cantab.), D.Sc. (London).	Late Professor of Textile Technology, University of Manchester, and College of Technology, Manchester.
2.	Assistant Director, Technological Laboratory.	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.) ..	Late Head of Science Department, Islamia College, Lahore.
3.	Spinning Master, Technological Laboratory.	Mr. R. P. Richardson, A.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
4.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc. Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
5.	Senior Research Assistant (Assistant Technologist).	Mr. D. F. Kapadia, B.Sc., Tech. (Manch.), B.A. (Bom.)	Research Scholar, Technological Laboratory (Textile Physics).
6.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
7.	Temporary Senior Research Assistant (Physicist).	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Do. do.
8.	Junior Research Assistant (Microscopist).	Mr. H. N. Dutt, B.Sc., M.B. (Calcutta) ..	Recently Demonstrator in Botany, Gujerat College, Ahmedabad.
9.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Muktesar, U. P.
10.	Statistician	Mr. V. Venkataraman, M.A. (Madras) ..	Recently Statistical Assistant, Labour Office, Government of Bombay, Bombay.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

TECHNOLOGICAL LABORATORY BOMBAY.—*contd.*

11.	Temporary Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technologieal Laboratory (Textile Physics).
12.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	—
13.	Junior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.) ..	—
14.	Junior Tester	Mr. K. G. Deo	—
15.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	—
16.	Junior Tester	Mr. K. S. Marar, B.A.	—
17.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	—
18.	Junior Tester	Mr. G. D. Bhide, B.Sc...	—
19.	Junior Tester	Mr. K. V. N. Nayar	—
20.	Junior Tester	Mr. V. N. Modak, B.Sc.	—
21.	Junior Tester	Mr. L. V. Sundararaman, B.A.	—
22.	Junior Tester	Mr. P. S. Sambamurthi	—
23.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	—
24.	Junior Tester	Mr. P. H. Sharma, B.A.	—
25.	Junior Tester	Mr. A. J. Farid	—
26.	Junior Tester	Mr. U. K. Benegal, B.A.	—
27.	Junior Tester	Mr. P. V. Nachane, B.Sc.	—
28.	Spinning Assistant	Mr. N. Iyengar	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE.

29.	Director, Institute of Plant Industry, Indore.	Mr. A. Howard, C.I.E., M.A. (Cantab.) ..	Recently Imperial Economic Botanist.
30.	Offg. Director of Institute of Plant Industry, Indore. (For two months with effect from 3rd August 1930)	Rao Saheb S. L. Tambe, B.A.	Rural Development Commissioner, Holkar State, Indore.
31.	Physiological Botanist	Mrs. G. L. C. Howard, M.A. (Dublin), M.A. (Cantab.).	Recently 2nd Imperial Economic Botanist. (Since deceased.)
32.	Assistant in charge of Extension Work ..	Mr. K. R. Joshi, L.Ag. (Nagpur)	Lent by Indore State Agricultural Department. 15 years in Indore State Agricultural Department. On deputation to Jaipur State.
33.	Personal Assistant to the Director ..	Mr. Misri Lal Saksena, L.Ag. (Cawnpore) ..	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.
34.	Assistant in charge of Seeds and Experimental Farm.	Mr. G. C. Tambe, B.Ag. (Bombay)	—
35.	Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay) ..	Research Student, Indian Central Cotton Committee.
36.	Junior Assistant, Plant Breeding ..	Mr. Kuber Singh, B.Ag. (Bombay)	—
37.	Junior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad) ..	—
38.	Junior Farm Assistant	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	—

LIST OF SCIENTFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

BOMBAY RESEARCH SCHEMES.

(i) *Physiology.*

40.	Cotton Physiologist in Charge of Cotton Research Scheme No. I—Physiology of the Cotton Plant in Gujerat.	Mr. K. V. Joshi, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
41.	Senior Assistant	Mr. S. V. Godbole, M.Sc., B.Ag. (Bombay) ..	—
42.	Junior Assistant	Mr. N. M. Nitimargi, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture. (On leave for one year and eleven months from 9th September 1929.)
43.	Junior Assistant (Acting)	Mr. G. B. Patel, B.Ag.	On deputation from Bombay Department of Agriculture.
44.	Bio-Chemical Assistant	Mr. R. B. Gode, M.Sc.	—
45.	Junior Assistant	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
46.	Research Assistant	Mr. M. A. Shama Iyengar, B.Ag.	Research Student, Indian Central Cotton Committee.

(ii) *Mycological.*

47.	Special Cotton Mycologist in charge of the Cotton Wilt Disease, Dharwar.	Mr. G. S. Kulkarni, M.Ag. (Bombay) ..	Plant Pathologist in the Bombay Department of Agriculture—On deputation.
48.	Senior Assistant	Mr. B. B. Mundkur, M.A. (Madras) on leave..	—
49.	Acting Senior Assistant	Mr. T. R. Khadilkar, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
50.	Junior Assistant	Mr. J. D. Ranadive, B.Ag., B.Sc.	Research Student, Indian Central Cotton Committee.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

	BOMBAY RESEARCH SCHEMES—*concld.*		
	(iii) *Entomological.*		
51.	Cotton Entomologist, Spotted Boll-worm Investigation, Surat.	Mr. B. P. Deshpande, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
52.	Research Assistant	Mr. N. T. Nadkarni, B.Ag. (Bombay)	—
53.	Research Assistant	Mr. B. J. Thaker, B.Ag. (Bombay)	On deputation from the Bombay Department of Agriculture.
54.	Research Assistant	Mr. M. S. Patel, B.Ag. (Bombay)	—
	(iv) *Khandesh Cotton Breeding Scheme.*		
55.	Graduate Assistant	Mr. N. R. Yardi, B.Ag. (Bombay)	—
56.	Graduate Assistant	Mr. M. S. Pandya, B.Ag. (Bombay)	On deputation from the Bombay Department of Agriculture.
57.	Non-Graduate Assistant	Mr. P. A. Rao	—
	(v) *Sind Research Scheme.*		
58.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)	—
59.	Senior Assistant	Dr. R. D. Rege, B.A., M.Sc. (Bombay), Ph.D. (London), A.T.I.C.	—
60.	Junior Assistant	Mr. Rustom M. Ranji, Dip. in Ag. (Bombay)	—
61.	Junior Assistant	Mr. R. G. Deshpande, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
	BOMBAY SEED DISTRIBUTION SCHEMES.		
	(i) *Hubli and Gadag.*		
62.	Graduate Assistant	Mr. B. S. Patil, B.Ag. (Bombay)	—
63.	Graduate Assistant	Mr. B. M. Dhumma, B.Ag. (Bombay)	

LIST OF SCIENTFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

BOMBAY SEED DISTRBUTION SCHEMES.—*contd.*

(ii) *Surat.*

64.	Cotton Assistant	Mr. H. U. Vora, B.Ag.	On deputation from Bombay Department of Agriculture.
65.	Cotton Assistant	Mr. B. K. Patel	—

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

66.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S.	Holds permanent post in Government service.
67.	1st Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag. and Post Graduate, Pusa.	On deputation from Central Provinces Agricultural Department.
68.	2nd Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
69.	3rd Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.)	On deputation from Central Provinces Agricultural Department.
70.	4th Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.
71.	5th Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do. do.
72.	6th Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjape, B.Sc.	—

MADRAS HERBACEUM SCHEME.

73.	Senior Assistant	Mr. R. Balasubramaniam, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.
74.	Assistant	Mr. G. Seshadri Ayyangar, M.A.	—
75.	Assistant	Mr. V. Ramaswami Mudaliar, B.A.	—
76.	Sub-Assistant	Mr. D. Devasirvatham, Government Tech. Exam. in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*contd.*

PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

77.	Cotton Research Botanist	Mr. Trevor Trought, M.A. (Cantab.), 1st Class Nat. Sci-Tripos Agric. Diploma, Cambridge University Development Board Scholar. (*On leave.*)	Recently Senior Botanist, Ministry of Agriculture, Egypt, for 6 years attached Cotton Research Board.
78.	Acting Cotton Research Botanist ..	R. S. L. Jaichand Luthra, B.Sc. (Hons.), M.Sc. (Punjab), D. I. C. Imperial College of Science and Technology.	Holds permanent post in I.A.S. Punjab Department of Agriculture.
79.	Officer in charge of the technical duties of Cotton Research Botanist.	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A., Trinidad.	Indian Central Cotton Committee's Research Scholar and State Research Scholar. On deputation from Punjab Agricultural Department.
80.	Assistant to Cotton Research Botanist ..	Chaudhri Mohd. Akbar, L.Ag. (3 years) ..	On deputation from Punjab Department of Agriculture.
81.	Technical Assistant	Bh. Sarup Singh, L.Ag. (4 years)	Do. do.
82.	Junior Research Assistant	Mr. Akbar Ali, B.Sc. (Post-Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from the Punjab Department of Agriculture.
83.	Technical Assistant	Mr. Ramesh Chandar, M.Sc. (Agri).	On deputation from the Punjab Department of Agriculture.
84.	Technical Assistant	Ch. Mohd. Rashid, L.C. Course	Do. do.
85.	Technological Research Assistant ..	Mr. K. R. Sen, M.Sc. (Dacca)	Research Student, Indian Central Cotton Committee.
86.	Temporary Assistant Physiologist ..	S. Sant Singh Varma, M.Sc. (Benares) ..	Do. do.
87.	Statistical Assistant	Mr. S. Subramonia Iyer, B.A. (Hons.), M.A. (Madras).	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE COMMITTEE'S RESEARCH GRANTS, AS ON 31ST AUGUST 1930—*concld.*

PUNJAB RESEARCH SCHEMES.—*contd.*

(ii) *Entomological.*

88.	Assistant Cotton Entomologist in charge, Pink Boll-worm Research Scheme.	Bh. Sohan Singh Bindra, M.Sc. (Zoo.), B.Sc. (Hons. School), Punjab.	Research Student, Indian Central Cotton Committee.
89.	Field Assistant	Mr. Ladha Ram, B.Sc.	—
90.	Field Assistant	Mr. Ganda Ram, B.Sc., F.E.L.	—
91.	Field Assistant	Mr. Dev Raj, B.Sc. (Hons. School)	—
92.	Statistical Assistant	Mr. Rishi Kesh, B.A. (Punjab)	—

UNITED PROVINCES RESEARCH SCHEME.

93.	Research Assistant, Pink Boll-worm Investigations.	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab).	Research Student, Indian Central Cotton Committee.

HYDERABAD BOTANICAL RESEARCH SCHEME.

94.	Cotton Research Botanist	Rai Saheb Kalidas Sawhney, M.Sc. (Punjab) ..	—
95.	Assistant to Cotton Research Botanist ..	Mr. B. B. Mulchandani, B.Ag. (Bombay) ..	On deputation from the Bombay Department of Agriculture.
96.	Assistant to Cotton Research Botanist ..	Mr. V. V. Narayanayya, Dip. Agri. (Poona Agri. College).	Do. do.

HYDERABAD SEED DISTRIBUTION SCHEME.

97.	Marketing Officer	Mr. M. V. Chitnis	—

TECHNOLOGICAL ASSISTANTS PAID DIRECT BY INDIAN CENTRAL COTTON COMMITTEE.

98.	Technological Assistant under Cotton Specialist, Coimbatore.	Mr. R. L. S. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.
99.	Do. under Cotton Breeder, Dharwar ..	Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.
100.	Do. under Cotton Research Botanist, Lyallpur.	Mr. K. R. Sen, M.Sc. (Dacca)	Research Student, Indian Central Cotton Committee.

APPENDIX VII.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	Assistant Entomologist, Lyallpur, Pink Bollworm Research Scheme.	Indian Central Cotton Committee.
,,	Mohammed Afzal, B.Sc., (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Assistant to Cotton Research Botanist, Punjab Agricultural Department. Punjab Botanical Research Scheme.	....
,,	Sheo Shankar Pande, M.Sc., (Punjab).	Nagpur	Do.	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Jiwan Singh, M.Sc. (Punjab).	Nagpur	Cotton Mycology ..	No record	Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme. Employed up to 31st March 1929. Scheme closed down from 1st April 1929.
,,	Ilabonto Banerji, M.Sc., (Calcutta).	Coimbatore.. ..	Cotton Botany ..	No record	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph. D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	B. B. Desai, B. Ag. (Bombay).	Dharwar	Do.	Cotton Breeder, Sind, Bombay Agricultural Service.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924.	Atul Chandra Dutt, M.Sc. (Calcutta).	Coimbatore.. ..	Do.	No record	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc. Honours School (Punjab).	Cawnpore ..	Cotton Entomology.	Research Assistant, Pink Boll-worm Investigation, United Provinces.	Indian Central Cotton Committee.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology.	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925.	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	Research Assistant under the Entomologist to Government, United Provinces, Cawnpore.	Services terminated from 30th June 1930.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur.. ..	Cotton Botany (Plant Breeding).	Junior Research Assistant to Cotton Research Botanist, Punjab. Punjab Agricultural Department.	Indian Central Cotton Committee.
,,	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur.	Cotton Entomology.	Entomological Assistant, Punjab Agricultural Department.	Now Senior Research Student to study "White Fly" Problem at Khanewal.

4

LIST OF RESEARCH STUDENTS—(*contd.*)

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
8 1925.	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	....	Technological Assistant, Dharwar, up to 31st July 1929. Resigned to proceed to England for further studies.
„	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Junior Assistant under Special Cotton Mycologist, Dharwar Wilt Scheme.	Indian Central Cotton Committee.
„	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
„	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
„	L. N. Rao, M.Sc. (Calcutta) ..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926.	D. F. Kapadia, B.A., B.Sc. (Tech. Manchester).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
„	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Senior Research Assistant (Physicist), Technological Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
„	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology..	Assistant, Surat Physiological Scheme.	Indian Central Cotton Committee.
„	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
7 „	Y. D. Wad, M.A., M.Sc. (Bombay).	Coimbatore.. ..	Cotton Bio-chemistry.	Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.

LIST OF RESEARCH STUDENTS—(*contd.*)

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Assistant at the Sakrand Experimental Station, Sind, Bombay Agricultural Department.	....
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Junior Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
1927.	R. Lakshminarasimha Iyengar, B.Sc. (Mysore)	Technological Research Laboratory, Matunga.	Cotton Technology..	Technological Assistant, Coimbatore.	Indian Central Cotton Committee.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	Government Scholar for study abroad.	....
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do.	Government Scholar for study abroad.	....
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology..	No record	....
,,	Sant Singh Varma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	Temporary Assistant Physiologist, Lyallpur, Punjab Botanical Scheme.	Indian Central Cotton Committee.
,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	No record	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....

LIST OF RESEARCH STUDENTS—(*concld.*)

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1928.	K. Dharmarajulu, B.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Junior Assistant, Dharwar Wilt Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc. (Honours School), Punjab.	Cawnpore	Cotton Entomology.	Research Student	Under training.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy..	Do.	
,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (Univ. of Edin.).	Institute of Plant Industry, Indore.	Cotton Agronomy	Madras Agricultural Service. Personal Assistant to Director of Agriculture.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Temporary Research Assistant, Technological Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
1929.	Srinagabhushana, B.Sc. ..	Technological Laboratory, Matunga.	Technology ..	Research Student	Under training.
,,	Bhai Pratap Singh Bhullar..	Lyallpur	Cotton Marketing and Economics.	Do.	
,,	Bhai Ajaib Singh Gulzar ..	Do.	Do.	Do.	
42 Total.					

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants.

ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST 1931.

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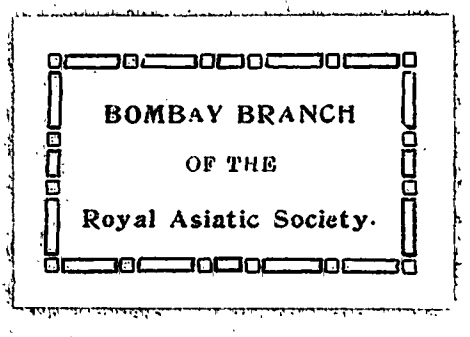
BOMBAY BRANCH
OF THE
Royal Asiatic Society.

ANNUAL REPORT

OF THE

Indian Central Cotton Committee, Bombay,

FOR THE

Year ending 31st August

1931.

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1931.

CHAPTER I.

THE Central Cotton Committee was constituted in March 1921 by Resolution No. 404-22 of the Government of India in the Department of Revenue and Agriculture and was the direct outcome of the recommendations of the Indian Cotton Committee presided over by Sir James MacKenna, Kt., C.I.E., I.C.S., whose report was published in 1919. Originally the Committee was purely advisory but with the passing of the Cotton Cess Act in 1923, it was incorporated and provided with funds for the purpose of improving and developing the growing, marketing and manufacture of cotton in India. The Committee thus fulfils two main purposes. It advises the Government of India and Local Governments on matters connected with the improvement of cotton growing and marketing. Secondly, in the administration of the proceeds of the Cotton Cess the Committee provides funds for research into cotton problems of an all-India nature or for homogeneous tracts of cotton growing country.

Not the least important aspect of the Committee's constitution is the provision of a common meeting ground for all branches of the cotton industry. As will be seen from the following paragraph, all the main interests associated with cotton, consisting of the grower, the agricultural expert, the ginner, the millowner and the exporter are represented and comprise the Committee. There is thus no branch of the cotton industry which cannot be dealt with authoritatively by the Committee. The interests of the cotton grower are however paramount and the Committee has constituted itself the champion of the Indian grower whose welfare is its chief concern.

PERSONNEL.

2. Under the Indian Cotton Cess Rules, members hold office for three years and one-third retire each year in rotation. The members of the Committee on the 31st August 1931 were as follows :—

(1) PRESIDENT—Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio.*

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in agricultural matters, *ex-officio.*

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. D. G. Munro, I.A.S., Deputy Director of Agriculture.
Bombay	Mr. T. F. Main, O.B.E., I.A.S., Director of Agriculture.
United Provinces ..	Mr. P. B. Richards, I.A.S., Entomologist to Government.
Punjab	The Director of Agriculture.
Central Provinces ..	Mr. F. J. Plymen, C.I.E., I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Major W. Ellis Jones, M.L.C.
The Bombay Mill-owners' Association..	Mr. S. D. Saklatvala.
The Bombay Chamber of Commerce ..	Sir Joseph A. Kay, Kt. (*Vice-President*).
The Indian Merchants' Chamber	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. D. McCallum.
The Ahmedabad Mill-owners' Association .	Sheth Naranlal Jivanlal.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce	Mr. J. Tinker.
The Empire Cotton Growing Corporation.	Mr. W. Roberts.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Mr. Y. G. Deshpande. Rao Bahadur K. J. Deshmukh.
Madras	Mr. H. B. Moore.
Punjab	Ch. Zafrulla Khan, M.L.C.
Bengal	Mr. Girija Prasanna Chakravarty.

(7) CO-OPERATIVE BANKING REPRESENTATIVE—Sardar Sampuran Singh.

(8) REPRESENTATIVES OF COTTON GROWING INDUSTRY.

Madras	M.R.Ry. V. C. Vellingiri Gounder, Avl. M.R.Ry. K. Sarabha Reddi Garu, M.L.C.
Bombay	Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Saheb Chinbasappa Shidramappa Shirahatti.
United Provinces ..	Rai Bahadur Amba Prasad, M.L.C. Rao Bahadur Rao Bikram Sinha, M.L.C.
Punjab	Major D. Vanrenen. Sardar Ujjal Singh, M.L.C.
Central Provinces and Berar.	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe, M.L.C.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General and Secretary to Government, Department of Commerce and Industries.
Baroda State	Mr. C. V. Sane, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Administrative Officer, Department of Agriculture.
Rajputana and Central India States	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Dr. W. Burns, I.A.S., Principal, Agricultural College, Poona.
3. Dr. L. C. Coleman, C.I.E., Director of Agriculture, Mysore State.
4. M.R.Ry. V. Ramanatha Iyer, Avl., Cotton Specialist, Coimbatore.
5. Mr. C. R. Palairet, Member for Commerce and Industry, Holkar Durbar, Representative of the Indore State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer, Sind.
7. Mr. Girdharlal B. Kotak, Representative of the Karachi Indian Merchants' Association, Karachi.
8. B. Ram Prasad, Assistant Economic Botanist to Government, United Provinces.
9. Mr. Mohamed Azhar Ali, M.L.A.

Secretary—Mr. J. H. Ritchie, I.A.S.

Deputy Secretary—Mr. P. H. Rama Reddi, I.A.S.

Director, Technological Laboratory—Dr. Nazir Ahmad.

Sir Joseph A. Kay was appointed *Vice-President* in place of Mr. S. D. Saklatvala. He was previously Vice-President for the years 1925-26 and 1926-27.

SUB-COMMITTEES.

3. *Standing Finance Sub-Committee.*—The following members were appointed to form the Standing Finance Sub-Committee as required by the Rules under the Indian Cotton Cess Act :—

Sir Joseph A. Kay (*Vice-President*), *Chairman* ; Dewan Bahadur Sir T. Vijayaraghavachariar (*ex-officio*), Major W. Ellis Jones, Mr. S. D. Saklatvala, Rao Bahadur M. G. Deshpande, Rao Bahadur Bhimbhai Ranchodji Naik, Messrs. J. Vonesch and D. McCallum.

Eight meetings were held during the year.

4. The *Local Sub-Committee* consists of all members living in or near Bombay, although any member of the Committee may attend its meetings. The Sub-Committee deals with all subjects of a general nature between the half-yearly meetings of the Committee. The Sub-Committee consists of the following members :—

Sir Joseph A. Kay (*Vice-President*), Messrs. W. Ellis Jones, S. D. Saklatvala, J. Vonesch, Dr. V. N. Likhite, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. D. McCallum, Mr. M. P. Kolhe and Major D. Vanrenen.

Mr. C. V. Sane took the place of Dr. Likhite from June 1931.

Eleven meetings were held during the year, one of which was really an emergency meeting of the full Committee to discuss the low level of cotton prices and to devise measures for giving relief to the growers. About half the number of members attended. This same subject was discussed at another meeting of the Sub-Committee in October 1930 at which the following attended by invitation :—

The Hon'ble Sir Arthur McWatters, Kt., C.I.E., I.C.S., Finance Member, Government of India ;

Sir Frank Noyce, Kt., C.S.I., C.B.E., I.C.S., Secretary to the Government of India, Department of Education, Health and Lands ;

Mr. H. Denning, C.I.E., I.C.S., Secretary to the Government of India, Finance Department ;

Mr. K. M. MacDonald, Managing Governor, Imperial Bank of India, Calcutta ;

Mr. G. Wiles, C.I.E., I.C.S., Secretary to the Government of Bombay, Finance Department; and

Mr. J. W. Kelly, Deputy Controller of Currency.

On the 27th October 1930, the Sub-Committee took advantage of the presence in Bombay of the Hon'ble Sir George Rainy, K.C.S.I., K.C.I.E., I.C.S., Member for Railways and Commerce, Government of India, to discuss with him the question of a reduction of freight rates on raw cotton.

5. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee is also a Statutory Sub-Committee appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. The membership for 1931 was as follows :—

Sir Joseph A. Kay (*Vice-President*), Messrs. W. Ellis Jones, S. D. Saklatvala, D. McCallum, J. Vonesch, W. Roberts, H. B. Moore and J. Tinker and Sardar Sampuran Singh.

Stray cases of irregularities were reported during the year and action was taken without the necessity of calling a meeting of the Sub-Committee.

6. *Sub-Committee on Malpractices.*—The composition of this Sub-Committee was as follows :—

Sir Joseph A. Kay (*Vice-President*), Messrs. W. Ellis Jones, S. D. Saklatvala, D. McCallum and T. F. Main and Rao Bahadur Bhimbhai Ranchodji Naik.

The Sub-Committee was formed in 1929 to deal with all questions relating to abuses and malpractices. Only one meeting was held during the year. The mixing of Punjab-American cotton and "pools" of ginning and pressing factories were the principal subjects discussed.

7. *Agricultural Research Sub-Committee.*—The following members were appointed at the December meeting of the Committee to serve on this Sub-Committee :—

The President, The Vice-President (Sir Joseph A. Kay), Sir Purshotamdas Thakurdas, successor to Mr. A. Howard, Sardar Sampuran Singh, Messrs. W. Roberts, W. Ellis Jones, T. F. Main, G. R. Hilson, F. J. Plymen, D. Milne; Mr. B. C. Burt, Dr. V. N. Likhite, Dr. L. C. Coleman, Dr. W. Burns, Messrs. D. N. Mahta and Ram Prasad, Seth Kasturbhai Lalbhai, Messrs. H. H. Pandya, W. J. Jenkins, and P. B. Richards (additional members); Mr. Trevor Trought (co-opted member), and the Secretary.

In July 1931, the following changes took place :—

Mr. V. Ramanatha Iyer replaced Mr. G. R. Hilson, Mr. C. B. Mehta replaced Sir Purshotamdas Thakurdas, Mr. C. V. Sane replaced Dr. V. N. Likhite, and Sheth Naranlal Jivanlal replaced Seth Kasturbhai Lalbhai; Mr. Howard's place was taken by his successor at the Institute of Plant Industry, Indore, Mr. F. K. Jackson.

This Sub-Committee met twice during the year, just previous to the full meetings of the Committee. It reports to the full Committee the progress made during the year on the schemes financed by the Committee, examines fresh schemes submitted and studies the reports of Research Students.

8. *Technological Research Sub-Committee.*—This Sub-Committee meets during the half-yearly meetings of the Central Cotton Committee and deals with all matters connected with the Technological Laboratory and Technological Research. The following members composed the Sub-Committee during the year :—

The President, Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Sir Sorabji B. Mehta, Mr. W. Ellis Jones, Seth Kasturbhai Lalbhai, Messrs. D. Milne, B. C. Burt and T. F. Main, the Secretary, and two co-opted members from each of the following trade organizations :—

The Bombay Millowners' Association, the Ahmedabad Millowners' Association, and the East India Cotton Association.

Mr. C. B. Mehta took the place of Sir Purshotamdas Thakurdas, Mr. Y. G. Deshpande replaced Sir Sorabji B. Mehta and Sheth Naranlal Jivanlal replaced Seth Kasturbhai Lalbhai.

9. *Research Students Selection Sub-Committee.*—The following members were appointed on this Sub-Committee which met only once during the year to select research students in Economics for work in the Provinces :—

The President, Sir Joseph A. Kay (*Vice-President*), Messrs. S. D. Saklatvala, B. C. Burt, and G. R. Hilson, Dr. W. Burns, Mr. P. B. Richards, Dr. V. N. Likhite, Mr. D. Milne, Mr. F. J. Plymen, Dr. L. C. Coleman, Mr. H. H. Pandya, Mr. T. F. Main, Dr. Nazir Ahmad, successor to Mr. A. Howard and Mr. W. J. Jenkins.

The places of Messrs. Hilson and Howard and Dr. Likhite were taken by Messrs. V. Ramanatha Iyer, F. K. Jackson and C. V. Sane respectively.

10. As required by the Rules under the Indian Cotton Cess Act, a Special Sub-Committee met in March 1931 to select a successor to Dr. A. James Turner as Director of the Technological Laboratory.

11. As is only to be expected of a Committee the size of the Central Cotton Committee which meets only twice a year, the main work is carried on by means of these Sub-Committees which are composed chiefly of the Bombay members on whom devolves the lion's share of the work and responsibility. Their help has always been given cheerfully and ungrudgingly and the success which the Committee has achieved is largely due to their unselfish efforts.

MEETINGS.

12. The Central Cotton Committee held two meetings during the year, viz., on the 15th and 16th December 1930 and on the 13th and 14th July 1931. Owing to pressure of other work, the President, Dewan Bahadur Sir T. Vijayaraghavachariar, was unable to attend either meeting and the chair was taken by the Vice-Presidents, Mr. Saklatvala at the December meeting and Sir Joseph Kay at the July meeting. Sir Purshotamdas Thakurdas attended the July meeting as a visitor.

A list of the more important resolutions passed at these two meetings will be found in *Appendix I.*

STAFF.

13. Mr. J. H. Ritchie held charge of the office of Secretary throughout the year.

Mr. P. H. Rama Reddi, I.A.S., Principal of the Agricultural College, Coimbatore, was appointed Deputy Secretary in place of Mr. W. J. Jenkins, I.A.S., and assumed charge of his office on the 10th November 1930. He proceeded on three months' leave on medical certificate on January 2nd, 1931. On April 10th, 1931, he was deputed to act as Director, Institute of Plant Industry, Indore, pending the appointment of a permanent Director in place of Mr. A. Howard who relinquished charge at the beginning of April. Mr. Rama Reddi returned from deputation on the 29th July 1931 on the appointment of Mr. F. K. Jackson as Director of the Institute.

Dr. A. James Turner proceeded on leave for six months and 23 days prior to his retirement from the Committee's service. At its December meeting, the Committee passed a resolution acknowledging its appreciation of his services to the Committee.

Dr. Nazir Ahmad, Assistant Director of the Technological Laboratory, was appointed to officiate, until on the recommendation of a Special Sub-Committee appointed to select a successor to Dr. Turner, he was chosen to fill the post for a period of three years in the first instance. Dr. Nazir Ahmad assumed charge of the Directorship on the 1st April 1931.

Mr. Trevor Trought, Cotton Research Botanist, Lyallpur, was permitted by the Committee to accept the post of Cotton Botanist in the Sudan under the Empire Cotton Growing Corporation. He took leave for six months and 21 days from the 20th July 1931 prior to quitting the service of the Committee. Mr. Mohammed Afzal, Senior Assistant on the Punjab Botanical Scheme, will carry on the duties of Cotton Research Botanist until such time as a successor to Mr. Trought has been appointed.

The office staff has continued to give its loyal support and co-operation and I wish to record my appreciation of the help I have received from it during the year.

14. *Provincial and Local Cotton Committees.*—No meetings of Provincial or Divisional Cotton Committees were held during the year so that the hope expressed in paragraph 16 of last year's report has unfortunately failed to materialize. The Government of the United Provinces intimated recently that on account of financial stringency they had decided not to reconstitute for the time being their Provincial Cotton Committee at the expiry, this year, of its sanctioned term of appointment. The Central Cotton Committee has always had great belief in the usefulness of Provincial Cotton Committees and it heard with concern the decision of the United Provinces Government. The part that Provincial Cotton Committees could and should play in the improvement of cotton growing and marketing in their respective Provinces is being placed before the Central Cotton Committee at the forthcoming meeting in December in the hope that the discussion may instil into the representatives from the Provinces a desire and determination to make a success of their local organization. A Provincial Committee is in a much more favourable position than is the Central Cotton Committee to lay down the cotton policy that should be followed in the Province and without some such active help coming from each Province, the Central Cotton Committee is severely handicapped in its efforts to make improvements.

CHAPTER II.

THE WORK OF THE YEAR.

15. THE most striking feature of the year has been the development of the research work of the Committee. At the December meeting seven new schemes were sanctioned and in July one more was approved. Some of these were research in the real sense of the word while others were schemes for the more rapid extension and distribution of improved varieties of cotton evolved by the Agricultural Departments. The Committee is now financing 33 schemes at an estimated cost of Rs. 6,83,843 per annum. One scheme, first sanctioned in 1925 and which has been held up on account of the difficulty of obtaining the necessary trained and experienced staff, was finally launched in the year under review. The first year's experience of seed distribution schemes has convinced the Committee that in them the Agricultural Departments have a means of replacing very rapidly any variety of cotton with a new one. Particular mention was made last year of the marketing of the new *Verum* variety of cotton in the Central Provinces and Berar. The actual financing of the marketing operations was carried out by the Central Provinces Government but the Committee furnished extra staff for maintaining the purity of the crop and for the large amount of extra clerical work involved. For various reasons, which it is not necessary to enumerate here, the actual number of bales dealt with through the Agricultural Department's pool amounted only to 11,162 instead of the estimated 35,000—40,000. The average rate (f.o.r. Bombay basis) at which the 11,162 bales of *Verum* were sold was Rs. 212-8 per *candy* compared with the average daily quotation for *Broach* for the same period of Rs. 189-12 and Rs. 156 for *Oomras*. *Verum* seed amounting to 51¼ lakhs of pounds, sufficient to sow 262,000 acres on a very conservative estimate, was sold for sowing in the coming season. In addition, 31 lakhs lbs. seed of unguaranteed purity were estimated to have been sold for sowing through private agency. As will be seen in the next chapter the Committee sanctioned the continuance of the scheme for maintaining the purity of compact blocks of *Verum* in different parts of the Central Provinces and Berar. One of the schemes which the Committee has financed since 1923—*the United Provinces Pink Boll-worm scheme*—closed down in July after a most successful research. It set out to discover the amount of damage done by the *Pink Boll-worm* to the U. P. Bengals cotton crop and to find a remedy. It has found that if all the cotton seed in the United Provinces, including that used for feeding, is heat treated either by the hot-weather sun or by artificial means at a certain temperature, the *Pink Boll-worm larva*, hibernating in the seed, is killed and the cultivator will obtain a 50 per cent. increase in his crop, and a much better price for his produce on account of the absence of stain, both of which advantages mean an increase of at least Rs. 30 an acre. What further action can be taken by the Committee to bring these results to the notice of the grower for incorporation in his general farm practice will be considered at its coming December meeting.

16. One other very important feature of the year was a review of the Committee's work during the last six years and a tentative programme for the ensuing five years. A discussion of the note will be held at the forthcoming cold weather meeting. Arising out of the question of the low level of cotton prices mentioned in last year's report, the Committee resolved at its July meeting that an investigation should be carried out into the cost of production of cotton, with its rotation crops, in the different provinces of India. The matter has been referred to the Imperial Council of Agricultural Research, the Committee agreeing to pay its share for the information gleaned regarding cotton.

17. During the year under review a further decline in the area of cotton in India was recorded. From 27,053,000 acres in 1928-29 it fell to 25,922,000 acres in 1929-30, and to 23,616,000 acres in 1930-31. This was mainly due to the low prices obtained for cotton during the preceding seasons. The season 1930-31 was good on the whole, though the crops in the Bombay-Karnatak, Gujerat and Hyderabad were reported to have suffered considerably from pests, diseases and unfavourable weather conditions. The total estimated yield for the season was 4,820,000 bales of 400 lbs. as compared with 5,125,000 bales for the preceding season. The average yield per acre was 82 lbs. as against 79 in 1929-30.

The returns of cotton pressed show that during the season 1930-31 3,714,751 bales were pressed in British India and 1,190,108 bales in Indian States, making a total of 4,904,859 bales for the whole of India as compared with 5,285,641 bales pressed during the season 1929-30. The press returns, however, account for the cotton that passes out from the presses only. A certain amount of ginned unpressed cotton also goes direct to the mills. Voluntary returns by the mills situated in the major cotton growing Provinces of Bombay, Madras, the United Provinces, the Central Provinces and Berar, and the Punjab furnish information of the amount of loose cotton thus consumed. During the season under review 148,700 bales of 400 lbs. of unpressed cotton were received by the mills in those Provinces. Thus against the estimated crop of 4,820,000 bales of 400 lbs. net, the total quantity of ginned cotton accounted for alone amounted to 5,053,559 running bales. To the latter has to be added that part of the cotton crop which is used for domestic or extra factory consumption estimated at 750,000 bales, as well as the cotton pressed in those Indian States which do not furnish returns.

The consumption of Indian cotton in the Island of Bombay and in the Ahmedabad mills decreased by about 101,829 bales and 22,518 bales respectively (*vide Appendix VI*) from that of the previous year. This was due to the scarcity of the better types of Indian cotton, and the increased use of foreign cottons for spinning fine counts which were comparatively cheaper than Indian cotton. For the same reasons the world's total consumption of Indian cotton fell from 6,087,000 bales in 1929-30 to 5,860,000 bales in 1930-31.

Exports of cotton during the year under review were 3,729,000 bales of 400 lbs. as against 3,868,000 bales during the previous season and 3,998,000 bales during 1924-25, the previous record season. As will be seen from the table below, compiled from the East India Cotton Association returns, there was little change in the stocks of unsold Indian cotton in Bombay on the last day of the season :—

Descriptions.	31st August 1931.	31st August 1930.	31st August 1929.	31st August 1928.	31st August 1927.
Broach	38,577	31,012	15,053	17,242	15,463
Dholleras	57,559	37,354	40,291	60,336	33,698
Oomra	145,767	239,565	258,790	263,443	41,905
Khandesh	43,244	43,988	57,103	70,238	4,795
Bengals	38,800	28,276	63,121	50,988	12,720
Punjab-American	3,009	775	7,471	13,085	3,762
Dharwar	660	1,951	5,091	4,870	4,085
Comptas, Tinnevellys and Cambodia	37,416	16,785	29,249	44,346	27,218
Westerns and Northerns ..	22,466	9,048	25,486	27,404	22,528
Persian	..	..	31	190	200
Americans	11,838	297	333	2,034	1,920
Egyptians	2,021	..	..	..	5
East Africans	32,645	12,293	13,592	9,150	6,659
Other sorts	10,879	10,628	26,363	37,635	6,520
Total ..	444,881	431,972	541,974	600,961	181,578

It will be noticed that the slight excess over last year in the total stocks is due to the increase in the stocks of foreign cotton. There was a considerable reduction in the stocks of *Oomras* with an increase in almost all the other varieties.

THE COTTON TRANSPORT ACT.

18. In 1923, the Government of India, at the request of the Central Cotton Committee, passed the Cotton Transport Act which enables Local Governments to prohibit the import of cotton into any area within their jurisdiction. This Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior strains.

19. *BOMBAY.*—No change has taken place in the six areas notified in the Bombay Presidency although the policy to be followed in the Surat area still continues to be a bone of contention. The subject again came before the Committee for discussion at both meetings held during the year. At the later meeting, suggestions were made which, it is hoped, will give the Committee definite data regarding the merits of the two cottons, looked

at from the point of view of the growers' interests, to allow it to come to a decision. These suggestions are embodied in a resolution passed at the July meeting and will be found in *Appendix I.*

20. The area referred to in last year's report as the proposed Broach area has now been notified as a protected area known as the Nerbudda-Mahi Zone. The Committee passed a resolution at its last meeting thanking the Bombay Government and the Indian States concerned for their co-operation in this matter. The boundaries of this newly constituted zone will be found in *Appendix III.*

21. There was no change during the year in the protected areas in Baroda, Rajpipla and Chhota Udepur States.

22. *MADRAS.*—There is no change in the position as reported last year. The Tuticorin Chamber of Commerce challenged the statement made by the Director of Agriculture, Madras, and repeated by me in last year's report, that the amalgamation of the two Southern Zones had had the effect of reducing prices at Dindigul. The matter is still under correspondence. In his latest report on the working of the Act, the Director of Agriculture reiterates the harmful effects which the amalgamation of the two zones has had. To quote one small example; in December and January 2,250 imperial *maunds* of inferior Mysore cotton were railed from Hosur to Tiruppur for mixing with *Cambodia. Pulichai* seed, it is also reported, entered parts of Ramnad and Tinnevelly for sowing.

23. The area under the Central Provinces Cotton Transport Act, which protects the chief cotton growing districts of the Central Provinces and Berar from importation by rail of cotton from outside the Province, remained unchanged during the year.

24. The Durbar of the Holkar State passed, during the year, the necessary rules under the Indore State Cotton Transport Act which protects the whole of the State from cotton railed from outside. A copy of the notification will be found in *Appendix IV.*

25. No change was made during the year in the area protected under the Hyderabad State Cotton Cultivation and Transport Act. This Act was passed to protect the valuable *Bani* or *Gaorani* cotton which is grown on a large scale in the State.

26. Sangli continued with the Bombay Rules which were introduced into the State from 1st July 1930.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

27. On the analogy that "happy is the country that has no history," the Cotton Ginning and Pressing Factories Act may be considered a very

happy piece of legislation, for there is nothing to report. The Act worked smoothly during the year and the few cases of infringement were reported to the authorities concerned.

In order to find a way out of the difficulty arising from the decision of the Solicitors to the Government of India that a certified copy of an arbitration award of the East India Cotton Association would not be accepted as evidence in a Court of Law, it has now been arranged that whenever bales are under dispute for infringements under the Act, a member of the staff of the East India Cotton Association will be present to act as a witness in Court, should the necessity arise.

28. The marking of bales is now in force in the following Indian States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal Bundi, Cambay, Chhota Udepur, Datia, Dhar, Dhrangadhra, Faridkot, Gondal, Holkar State (Indore), Hyderabad (The Nizam's Dominions), Idar, Jaipur, Jamkhandi, Jaora, Jasdan, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kolhapur, Kotah, Lakhtar, Limbdi, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Patiala, Porbandar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayla, Shahpura, Tonk, Wadhwan, Wankaner and Western India States Agency areas.

Weekly cotton press returns are sent by all the above States except :—

Radhanpur, Sachin, Bundi, Kotah and Patiala.

Gwalior is still the only large Indian State which has not yet introduced legislation for the marking of bales. The Committee is informed, however, that the subject has been taken up by the State authorities and it is hoped this important gap will soon be filled.

As mentioned in last year's report, the Government of India was requested to ascertain particulars of the area of cotton grown in all non-reporting Indian States, the number of ginning and pressing factories and the principal markets for such cotton. The enquiry found a ready response from the States concerned and a very large amount of most useful information has been collected. The Committee was also put in a position to suggest to non-reporting States with pressing factories the desirability of introducing legislation on the lines of the Cotton Ginning and Pressing Factories Act. Some of the States addressed have already introduced the necessary legislation and others have signified their intention of doing so. The enquiry further elicited information with regard to the destination of cotton produced in States where ginning and pressing factories do not exist. In only a few States is the cotton produced consumed entirely in

the States. In the majority of cases State cotton goes to neighbouring British territory for ginning and pressing. This information is of considerable value to the authorities responsible for the preparation of cotton forecasts because it furnishes an important link between forecasts and cotton press returns.

MALPRACTICES.

29. Only three cases were reported during the year of bales having been rejected for containing damp or watered cotton. One lot came from Baroda State, having been pressed at Dabhoi, and the other two from Ahmednagar. Certified copies of the entries in the press registers were called for under Section 3 (3) of the Cotton Ginning and Pressing Factories Act and the information conveyed to the East India Cotton Association for posting.

A complaint was received through the Bombay Millowners' Association concerning a lot of Telhara *Verum* cotton having been irregularly packed. The name of the press was ascertained from the bale marks and the case was reported to the Director of Industries, Nagpur, who warned the owner of the factory and also addressed the Deputy Commissioner, Akola, to issue a warning to merchants and press owners regarding the evil of mixing.

The owners of three factories in the Bombay Presidency were prosecuted and fined Rs. 25 each for failing to submit for approval plans of factories before construction—under Section 9 (1) (*b*) of the Cotton Ginning and Pressing Factories Act.

The Committee's offer to the Punjab Government of Rs. 5,000 to provide half the cost of the staff required to organize Co-operative Sale Societies for the production and marketing of pure Punjab-American cotton was not accepted, as the Local Government saw little chance of being able to run successfully Sale Societies which dealt with American cotton only.

It was mentioned in last year's report that the Committee decided to ask certain Local Governments to carry out an investigation, at the cost of the Committee, into the effect of "pools" of cotton ginning and pressing factories on the price paid to the grower for his cotton. It was decided to confine the investigation to localized areas in Surat, Khandesh, the Central Provinces and in Ajmer-Merwara. The three Local Governments concerned agreed to the proposal and work has been undertaken. The reports from the Central Provinces and Ajmer-Merwara have been completed. The Bombay report is still awaited.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

30. The recommendations of the Special Sub-Committee which dealt with the reports on the investigations into the finance of the cotton crop

up-country and its marketing were forwarded to the Local Governments concerned and the further action taken by them during the year to give effect to these recommendations is given below :—

BOMBAY.—A Bill for the standardisation of weights and measures is under the consideration of Government.

The question of the formation of Co-operative Cotton Sale Societies was referred by Government to the Registrar of Co-operative Credit Societies who has submitted his report, but no copy has been received by the Committee nor has it been favoured with the Government's views.

Regarding the establishment of cotton markets, the Government agreed with the views of the Commissioner, Northern Division, that the time was inopportune for the establishment of open markets in Gujerat. In Khandesh a regulated market has been established at Dhulia.

MADRAS.—A Bill for the establishment of regulated markets for commercial crops has been drafted and will be introduced in the Legislative Council at an early date.

The loan for the acquisition of land for a cotton market at Adoni, asked for by the Municipal Council, was refused as Government was unable to grant it.

Telugu and Kanarese translations of the Madras Report have been published.

PUNJAB.—The Report has been translated into Urdu and published.

The enquiry into market practices has not been completed. The question of the establishment of open regulated markets by the Punjab Government will be considered on receipt of the report.

COTTON MARKETS.

31. The year has seen still further progress in the steps taken to open regulated cotton markets in different parts of India.

The Rules under the Hyderabad Agricultural Markets Act were passed in the course of the year. They have been further modified and the Committee has been consulted in this connection.

Since the Rules under the Bombay Cotton Markets Act were passed, one market has been opened in the Presidency at Dhulia.

A Bill to provide for the establishment and the better regulation of markets for commercial crops in the Presidency of Madras has been drafted and will be introduced in the Legislative Council shortly.

Revised Rules under the Berar Cotton and Grain Markets Law, bringing them into line with the recommendations of the Central Cotton Committee, have been promulgated and will be brought into use in the coming cotton season.

A Bill to establish similar markets in the Central Provinces has been drawn up by a member of the Committee who is also a member of the Central Provinces Legislative Council, and will be placed before the next meeting of the Council.

So far as the Committee is aware, no further progress has been made regarding the adoption of common standards for Indian cotton by the East India Cotton Association and the Karachi Joint Cotton Committee.

The Central Cotton Committee was consulted by the Karachi Joint Cotton Committee concerning a proposal to alter their standard for Punjab-American cotton from 6/8" *minimum* to 6/8" *average* and was asked for its opinion on the desirability of introducing this change and its possible bearing on the mixing of Punjab-American cotton. The Local Sub-Committee voted against the change because of the probable effect on mixing.

MARKETING OF IMPROVED VARIETIES OF COTTON.

32. The Technological Reports on Standard Indian cottons continued to supply to the trade details of the area, estimated outturns and spinning capabilities of those improved cottons, introduced by the several Departments of Agriculture, which are now grown on a commercial scale. Further information regarding this branch of the Laboratory's activities will be found in the report of the Director.

The marketing by the Central Provinces Agricultural Department of 11,162 bales of *Verum* cotton, grown by cultivators and pooled for the sake of obtaining a supply of pure seed and in order to command a satisfactory premium for the cotton, has already been referred to. A more detailed description of the scheme will be found in Chapter III.

No further sets of standards were supplied to the Manchester Cotton Association during the year.

GENERAL.

33. Complaints of the danger of the re-establishment of *Pulichai* cotton (*G. neglectum var. roseum*) in the Tinnevelly District of the Madras Presidency were received from several important commercial firms and also from the Tuticorin Chamber of Commerce. The question was immediately taken up by the provincial agricultural authorities and was considered first by the Tuticorin Local Cotton Committee, then by the

Madras Provincial Cotton Committee and finally by the Indian Central Cotton Committee. Several recommendations were made to avert the threatened danger but as none of these was considered effective enough to produce the desired result and as no action could be taken under existing legislation, the Central Cotton Committee at its meeting in December 1930 recommended to the Madras Government that legislative measures should be resorted to. The representatives of cotton growers on the Committee were, however, against this action as they considered growers should be given full liberty to sow whatever variety of cotton they wished. As a result of the Committee's recommendation a Bill is under the consideration of the Local Government which has for its object the prohibition of the cultivation and possession of certain kinds of cotton, the mixing of such cotton with other cotton and the trade in and the restriction of the use of such cotton. Several of the penalties in the draft Bill were considered by the Local Sub-Committee to be too severe and a recommendation to the Madras Government to temper them has been made. The draft Bill will be found in *Appendix V.*

PROPOSED AMENDMENT OF THE BOMBAY COTTON CONTRACTS ACT.

34. The Central Cotton Committee was asked by the Cotton Contracts Act Committee for its views on the necessity for amending the Bombay Cotton Contracts Act. This Committee was formed by the Bombay Government to enquire into the working of the Act in Bombay. After considerable discussion the Central Cotton Committee made several recommendations, the majority of which were accepted either in whole or in part and incorporated in the report submitted to the Government of Bombay by the Cotton Contracts Act Committee.

PUBLICITY AND PROPAGANDA BY THE COMMITTEE.

35. As an answer to the criticisms levelled at the Committee from time to time that its work is imperfectly known to the public in general and to the mass of cotton growers in particular, the Committee decided to embark on a policy of publicity and propaganda. The Local Sub-Committee considered in detail the measures which, in its opinion, were necessary to lead to the desired result and submitted to the Central Cotton Committee in July 1931 a comprehensive report which was adopted after amendment. The chief recommendations were as follows :—

" In the first place, we consider that the Technological Laboratory obtains enough publicity by means of its reports and bulletins and there is no need to devise means to increase the publicity given to that branch of the Committee's activities.

We recommend that the Annual Reports of the Committee and other suitable bulletins and pamphlets should be sent to all members of Legislative Councils, the Assembly, the Council of State, Agricultural Associations, Chambers of Commerce and Co-operative Central Banks. We also consider that Cotton Market Committees would benefit by receiving a copy of each of such publications. We do not think it advisable, however, to publish a translation of these reports in the various vernaculars.

The *Communique* issued after each meeting should be sent to the Associated Press and to Provincial Information Bureaux and every effort should be made to get vernacular papers to publish translations of the *communiques* and a " write up " of the Proceedings.

A short description of certain schemes being financed by the Committee should be written up for publication in the Associated Press and also in the principal vernacular newspapers.

Popular vernacular leaflets giving simple descriptions of the work being done by the Committee in each cotton tract should be prepared and broadcasted in the Province concerned.

We consider that much more direct publicity than has been done in the past could be given to the Committee and its work by the Provincial Agricultural Departments and by the Provincial representatives on the Committee. The Committee should request the Head of the Agricultural Department in each Province to submit proposals for the extension of publicity and propaganda with regard to the Committee's work in the Province and to indicate in what manner and to what extent the assistance of the Committee could be most profitably utilized in such work.

The Technological Laboratory should prepare a representative set of exhibits to include the cottons, improved and ordinary, of all Provinces, which could be sent to Agricultu ral Fairs and Exhibitions, when desired."

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

36. *The Mexican Boll-weevil.*—With a view to prevent, through imported American cotton, the introduction into India of the most serious of all cotton pests, viz., the Mexican Cotton Boll-weevil (*Anthonomus grandis*), the Government of India, at the instance of the Indian Central Cotton Committee, has restricted, since 1925, the import of American cotton to a single port, namely Bombay, and only after fumigation with hydrocyanic acid gas. During the year under review 128,845 bales were fumigated at Bombay as against 12,759 bales during the previous year. On account of large imports it has been possible for the Committee to recommend to the Government of India a rebate of fumigation fees at the rate of 8 annas per bale on all cotton fumigated between the 1st April 1930 and the 31st March 1931. It is also gratifying to be able to record that the Government of India, the Bombay Port Trust and the Landing Contractors have, during the year under review, reduced the fumigation charges on round or half bales. The Government of India also agreed to a simplification of the procedure by directing that notices of consignments should be sent to the Docks Manager, Bombay Port Trust, instead of to the Collector of Customs.

37. *The Red (Sudan) Boll-worm and other pests.*—The restrictions placed on the import of foreign cotton seed under the Government of India Notification No. 1213-Agri., dated the 27th May 1930, in the Department of Education, Health and Lands and the entire prohibition of the import of foreign *kapas* (unginned cotton) under the Government of India Notification No. 897-Agri., dated the 24th July 1925, continued in force throughout the year. At its twenty-third meeting, the Committee reconsidered the present restrictions on the import of foreign cotton seed and decided to recommend

to the Government of India that any person should be allowed to import, through the authorized officers mentioned in the schedule, any quantity of seed up to 9 cwts.

COTTON STATISTICS.

38. *Raw cotton trade statistics.*—Reference has been made in previous reports to the re-introduction of the rail and river-borne raw cotton trade statistics. These figures were used by the Director of Agriculture, Bombay Presidency, to check the accuracy of the cotton forecasts for the season 1929-30, and he was of opinion that these trade statistics were " absolutely essential for the comparison of the forecast estimates with the press statistics to give a true picture of the situation." At his suggestion the Committee decided to defer the comparison of forecasts with press returns until trade statistics for the whole season were available. The Committee has also urged the separation of Kathiawar from the Gujerat trade block, in the classification of trade blocks now adopted for the purposes of raw cotton trade statistics.

39. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for Indian mills of American cotton, the arrivals and the quantity at sea. Importers and millowners of Bombay again furnished information confidentially regarding their purchases of American cotton, and the Committee again wishes to record its thanks to them for their valued co-operation.

40. *Cotton consumption.*—The compilation and publication of the monthly statements* (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States, (3) of loose cotton received in the mills in the major cotton growing Provinces, and (4) a consolidated statement of (1) and (2), specially meant for publication in the daily Press, was continued. The usefulness of these figures has been greatly enhanced by the arrangement made with Local Governments in which District Collectors supply the Committee with the monthly cotton consumption statements on or before the 10th day of the succeeding month, thus enabling the Committee to publish the all-India figures a month earlier than before. The Committee's thanks are also due to the Indian States concerned for their co-operation in this matter.

COLLECTION AND SUPPLY OF INFORMATION.

41. As in past years, notes† on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee were contributed to the Bombay Cotton Annual published by the East India Cotton Association.

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* Appendix VI. † Appendix VII.

42. The system introduced in March 1929 of circulating the more scientific and technical journals between the cotton research institutions financed by the Committee worked satisfactorily during the year. This system prevents the unnecessary duplication of literature purchased out of the Committee's funds, and also affords an opportunity to *mofussil* research workers to peruse literature of a more scientific nature than they normally would.

43. The Committee continued to receive from a large number of private and public institutions a considerable amount of literature dealing with different phases of the cotton industry for which its thanks are due. Special acknowledgments are due to the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, to the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the receipt of their publications for distribution to members of the Committee.

PUBLICATIONS.

44. The following bulletins and reports were published during the year :—

(1) Cotton Improvement in India.

(2) Limit Spinning Tests on Cambodia and Mollisoni Cottons. (Technological Bulletin A-17.)

(3) Technological Report on Standard Indian Cottons, 1931. (Technological Bulletin A-18.)

(4) The Weight per inch of Fibres of Different Lengths and the Numbers of Fibres of Different Lengths per Seed, for each of the Standard Indian Cottons. (Technological Bulletin B-7.)

(5) The Foundations of Yarn-Strength and Yarn-Extension : Part III—The Clinging Power of Cotton. (Technological Bulletin B-8.)

(6) The Foundations of Yarn-Strength and Yarn-Extension : Part IV —The Influence of Yarn-Twist on the Diameters of Cotton Yarns and on the Proportions of Fibre-Slippage and Fibre-Fracture in Yarn-Breakage. (Technological Bulletin B-9.)

(7) Studies in the Sampling of Cotton for the Determination of Fibre Properties : Part III—The Size and Reliability of a Satisfactory Sample. (Technological Bulletin B-10.)

(8) Random and Systematic Selections of Warp-Specimens in Cloth Sampling. (Technological Bulletin B-11.)

(9) A Study of Comparative Results for Lea, Single Thread, and Ballistic Tests on Yarns from Standard Indian Cottons. (Technological Bulletin B-12.)

(10) The Determination and Variation of Twist in Ring-spun Cotton Yarns. (Technological Bulletin B-13.)

(11) Spinning Test Reports on 1929-30 samples of :—Kampala, Busoga and Jinja Cottons. (Technological Circular No. 37.)

(12) Spinning Test Reports on 1930-31 samples of :—

(*a*) Bengals Cotton. (Technological Circular No. 35.)

(*b*) Khandesh Cottons. (Technological Circular No. 39.)

(*c*) Ujjain Cottons. (Technological Circular No. 40.)

(*d*) C. P. No. 1, Muttia, Khandesh and Berar Cottons. (Technological Circular No. 44.)

(*e*) Lattur and Nanded Cottons. (Technological Circular No. 45.)

(*f*) New Broach (Salar) Cotton. (Technological Circular No. 46.)

(*g*) Jagadia, Bawla and Kadi Cottons. (Technological Circular No. 47.)

(*h*) Hubli Kumpta and Hubli Upland Cottons. (Technological Circular No. 48.)

(*i*) Surat and Broach Cottons. (Technological Circular No. 49.)

(*j*) Bailhongal and Hubli Kumpta Cottons. (Technological Circular No. 50.)

(*k*) Punjab-American, Jagadia Farm and Navsari Cottons. (Technological Circular No. 51.)

(*l*) Karunganni and Karnool Cambodia Cottons. (Technological Circular No. 52.)

(*m*) Nandyal Cotton. (Technological Circular No. 53.)

(*n*) Surat, Navsari and Cambodia Cottons. (Technological Circular No. 54.)

(*o*) Dhollera, Westerns, Farm Westerns and Kumpta Cottons. (Technological Circular No. 55.)

(*p*) A. R. Kampala, A. R. Busoga and A. R. Jinja Cottons. (Technological Circular No. 56.)

(*q*) Kalagin, Bijapur and Bagalkote Cottons. (Technological Circular No. 57.)

(*r*) Upland Cambodia and Karunganni Cottons. (Technological Circular No. 58.)

(13) Technological Reports on 1930-31 samples of:—

(*a*) Verum 262 (Akola) Cotton. (Technological Circular No. 36.)

(*b*) Verum 262 (Nagpur) Cotton. (Technological Circular No. 38.)

(*c*) Umri Bani Cotton. (Technological Circular No. 41.)

(*d*) Punjab-American 289-F Cotton. (Technological Circular No. 42.)

(*e*) Punjab-American 4-F Cotton. (Technological Circular No. 43.)

SECRETARY'S TOURS.

45. During the year, I visited the following places in connection with the Committee's work :—

Calcutta, Nagpur (twice), Akola, Khanewal, Lyallpur (twice), Lahore (twice), Dhulia, Amalner, Jalgaon, Bhusawal, Indore (four times), Surat, Dharwar, Coimbatore, Madras, Gwalior, Poona and Simla.

FINANCIAL.

46. In *Appendix VIII* will be found a statement showing the Receipts and Expenditure and also the Balance Sheet for the year ending 31st March 1931. Receipts amounted to Rs. 9,05,804 and expenditure to Rs. 7,38,412 against an estimated expenditure of Rs. 9,70,677. The principal items of saving were under Seed Distribution and Extension Schemes (Rs. 30,858) —several schemes sanctioned were held in abeyance ; Technological Research (Rs. 16,300) ; Research Studentships (Rs. 27,400) ; Co-ordination of Cotton Research in Bombay (Rs. 19,000) ; other Bombay Schemes (Rs. 22,000) ; Madras Pempheres and Physiological Scheme (Rs. 20,812) ; Punjab Schemes (Rs. 18,000) ; Central Provinces Schemes (Rs. 19,000) ; Hyderabad (Rs. 7,250) and Bikaner (Rs. 5,500). In the current year receipts are estimated at Rs. 8,06,000 and expenditure at Rs. 10,96,910. With the new schemes sanctioned during the year the Committee will, for the first time, be compelled to draw on its savings.

CHAPTER III.

RESEARCH.

47. THE funds of the Central Cotton Committee are employed, in the words of the Cotton Cess Act, "for the improvement and development of the growing, marketing and manufacture of cotton in India." This is carried out by two methods. In the first place the Committee has kept under its own direct control certain branches of its activities, e.g., the Technological Laboratory, and secondly it subsidizes Provincial Departments of Agriculture to enable specific problems to be investigated. In addition, a large sum is supplied annually to the Institute of Plant Industry, Indore, which is a central research station for cotton and other agricultural problems in the largest homogeneous cotton tract in India. The grants to Provincial Governments are utilized for two distinct purposes, viz., for research and for the extension of improved varieties of cotton. Falling under the former category are included several botanical schemes for the purpose of obtaining improved strains of cotton by selection and hybridization; the study of the life-history of certain cotton pests and methods of combating them; a physiological investigation into the causes of shedding of buds, flowers and bolls; an investigation into the reasons for the preference of the *Cotton Stem Borer* for certain varieties of cotton to the partial exclusion of others; ways of overcoming the loss caused by *wilt* and *root rot* and two investigations dealing with the crops grown in rotation with cotton. The second branch of the Committee's activities in the Provinces consists in helping to extend improved varieties which have already been evolved by the Agricultural Departments and also to help to bring to the notice of the growers the results of those schemes financed by the Committee which have proved successful. This latter phase will become increasingly important as the schemes now in train mature. A modest beginning has been made in the year under review in the propaganda work which is being undertaken in the Surat area to prevent the carry-over of the *Spotted Boll-worm*. Grants have also been given in the past to Local Governments for enquiries into the finance and marketing of cultivators' cotton in the primary markets and also for investigations in three Provinces into the effect of "pools" of cotton ginning and pressing factories on the price paid to the growers for their produce. Technological Assistants have been posted to four Botanical Schemes to help the Cotton Breeders in the initial stages of research on the cotton fibre. The training of workers for the different branches of the Committee's activities has also received attention from the Committee and since 1923 thirty-seven men have been given a training to fit them for carrying out or helping in the numerous schemes in which the Committee is interested.

TECHNOLOGICAL LABORATORY.

48. The report of the Director, Technological Laboratory, for the year under review forms Chapter V of this report. As will be seen, the work of the Laboratory continues to increase and every year sees a fresh record in the number of samples spun. During 1930-31 there was an increase of 28 per cent. as compared with last year, though the number of lots spun remained practically the same. The reason for this apparent paradox is that it has been found impossible as in the past to spin all samples in duplicate lots. The testing of all samples in duplicate is now only possible by increasing the staff, accommodation and equipment of the Laboratory. The samples tested fall into three main classes : (1) Agricultural samples, (2) Standard cottons and (3) Trade samples. The first classification consists chiefly of promising strains of new cottons supplied by Cotton Breeders and comprises the larger proportion of the total number tested, amounting in the year under report to 65 per cent. The second category represents those improved varieties of cotton introduced by the several Agricultural Departments and now grown on a commercial scale. Twenty were tested during the year and the results published in the annual bulletin " Technological Reports on Standard Indian Cottons." From the results of these tests it is hoped to be able to judge the spinning value of a cotton by a study of its fibre properties without the necessity for a spinning test. The third broad class into which the cottons received for testing are divided is a more recent development. For the second year tests were made on samples selected by the Standards Committee of the East India Cotton Association representing the average commercial crop of the season and in addition spinning tests were carried out on samples supplied by various mills through the Millowners' Associations of Bombay and Ahmedabad from the first of the season's arrivals of different cottons. Forty-eight were tested and the results published in two-page Technological Circulars.

Special tests were carried out during the year on *Banilla* and *Karunganni* cottons. The former, introduced by the Agricultural Department in Khandesh, has shown signs of gradual deterioration in spinning value even in the samples grown on Government Farms. During the year arrangements were made to test about twenty samples grown under field conditions in the districts. The results are full of interest, but it has been decided to repeat the tests in the coming year before publication. Five samples of *Karunganni* containing from 16 per cent. to 31 per cent. of low quality cotton known as *Pulichai* were tested and the results show how important it is to stamp out the cultivation of *Pulichai* which is grown in the Tinnevelly District as an adulterant. The best of the samples was suitable for 16s highest standard warp counts while the average for the five samples was 12s only, the average over seven seasons for pure *Karunganni* being 24s. Further tests will be carried out on mixtures containing known proportions of *Karunganni* and *Pulichai*. Tests, when completed, now being made at the Laboratory on 289*F* cotton after combing, should prove of considerable interest to Indian mills which are importing large quantities of foreign cotton for spinning finer

counts. The preliminary results show that 60's and 80's yarns of the requisite strength and evenness can be spun when it is combed to the extent of 20 per cent. and 30 per cent. The waste removed by the comber when mixed with *4F* has been spun into 16s. It is proposed to take up similar work on *Cambodia, Nandyal* 14 and 1027 *A.L.F.*

A complete moisture testing section of the Laboratory was opened during the year in the Cotton Exchange Buildings at Sewri, Bombay, with the intention that the tests should form the basis for a system of " blind survey." Preliminary work during the year consisted in finding out the normal moisture content of bales from the Central Provinces and Berar, the Punjab and Broach pressed under known conditions of temperature and humidity without extra humidification. The testing of the ordinary commercial bales as they arrive in Bombay will be taken in hand next season.

INDORE INSTITUTE OF PLANT INDUSTRY.

49. The Director's Annual Report will be found in *Appendix II* which may be referred to for details of the work being carried out. The Indore Institute was opened in 1924 mainly as a Central Research Institute for cotton. The programme of work laid down at the start includes the general botany, physiology and genetics of Indian cottons in addition to a number of agricultural investigations connected with cotton growing on the black soils of Central India. Since its inception the Institute has devoted most attention to the agronomy of the cotton crop, as, in the view of Mr. Howard given in the quinquennial report of the Institute, " compared with the results which follow better farming, the improvement of the variety by itself is a comparatively minor matter. It is therefore not much use trying to improve the variety alone. The work of the plant breeder should go hand in hand with improved agronomy and then and then only can the great potentialities of the cotton areas of India be realized." The combined effect of proper field grading, surface drainage, clean cultivation and a normal application of compost has nearly trebled the yield of cotton on the farm. The results of successful research are of little value unless they are incorporated into the general farm practice of the country-side and every effort is being made to instil into the minds of the grower the ease with which they can increase their yield. This is being accomplished by inviting batches of cultivators from the surrounding States to see by ocular demonstration the results achieved on the Farm, by training men of the *kamdar* type in the methods employed at the Institute and by giving a training to district officers of the contributing States who wield considerable influence in their respective charges. Visits paid to the States by the Director and his staff and the issue of leaflets from time to time help to build up confidence in the Institute which will be of great value when the work of the Institute bears fruit, and further improvements are ready for dissemination.

With the death during the year of Mrs. G. L. C. Howard and the retirement of Mr. Albert Howard, the scientific world in general and the Indore

Institute in particular, have lost two prolific and brilliant workers in the field of agricultural research.

GRANTS-IN-AID.

50. Research work on cotton is carried out by the Departments of Agriculture in the Provinces and Indian States while the Committee merely provides the funds for extra staff and equipment for certain approved lines of work. Schemes are usually submitted by Directors of Agriculture and these have first to receive the approval of the Agricultural Research Sub-Committee before being sanctioned by the Central Cotton Committee. The Committee is kept in close touch with the progress of the schemes by means of annual reports submitted by the officers in charge.

At present the Committee provides funds for eighteen research schemes now in progress while two more have been sanctioned though work has not yet commenced on them.

The existing schemes are as follows :—

Madras	3—1 Botanical, 1 Physiological and 1 Entomological and Physiological.
Bombay	4—1 Botanical, 1 Physiological, 1 Mycological and 1 Entomological.
Central Provinces ..	1—Botanical.
United Provinces ..	1—Entomological.
Punjab	3—1 Botanical and Physiological, 2 Entomological.
Sind	1—Physiological.
Hyderabad	2—1 Botanical, 1 Survey.
Indore	1—Botanical and General.
Bikaner	1—Botanical.
Burma	1—Agronomic.

The two schemes which have not yet started, though funds have been allotted, are :—

Bombay	Co-ordination of Cotton Research.
Baroda	Root Rot Investigation.

SCHEMES IN PROGRESS.

MADRAS PRESIDENCY.

51. *The Madras Herbaceum Scheme* commenced in 1923 and was extended for two years in 1928 and again for a further period of five years from July 1930 to permit of hybridization being carried on in the hope of obtaining an *Uppam* strain of cotton which will spin and yield as well as *Karunganni*. At present the cultivators sow a mixed crop of *Uppam* and *Karunganni* as an insurance against failure of the rains. In years of good rainfall *Karunganni* is much more profitable but yields little or nothing in a year of scanty rainfall. *Uppam* on the other hand is a hardy variety which can be relied on to give an outturn even under very adverse conditions. The first part of the scheme consisted in the isolation of unit species of the *Uppam* mixture and when it was found that the limit of improvement by selection had been reached and that none of the *Uppam* strains approached *Karunganni* in yield or quality, it was extended for a further five years to try and obtain by hybridization what selection had failed to achieve. A cross was made some years ago between *Indicum* and *Cernuum* and the progeny has again been crossed with *Uppam strain No.* 2113—one of the best strains evolved in the first phase of the work. This is in the *F2* generation and selections are now being made from it. Further crossing between *Obtusifolium* and *Indicum* has been attempted and the results have provided considerable material for further work. An attempt has also been made to induce mutation by X-Ray treatment and desirable types may be obtained by this means.

52. *Fodder Cholam Scheme.*—This scheme was sanctioned for three years at the 1930 monsoon meeting of the Committee and work was commenced in the year under review. The scheme consists of an investigation into the causes of the poor yield of cotton when grown in rotation with fodder *cholam* (*Andropogon sorghum*), a phenomenon which does not occur when "*cumbu*" (*Pennisetum typhoideum*) is the alternative crop. The problem is being attacked along the following lines :—

(1) Deficiency of moisture in the soil after "*cholam.*"

(2) Difference in treatment of the two fodder crops, spacing, manuring and intercultivation.

(3) Exhaustive nature of "*cholam*" on the soil as compared with "*cumbu.*"

(4) Investigation into probable denitrification caused by the descent of the sugary sap into the soil from "*cholam.*"

(5) The formation of toxic products from the decomposition of "*cholam*" stubble.

(6) Deficiency of available potassium in the soil, thus causing excess nitrogen to act as a toxin.

As "*cholam*" is a very common rotation with cotton in India, the results of this investigation should be of great economic value.

53. *The Pempheres and Physiological Scheme* was first sanctioned in 1923 but owing to the difficulty of obtaining experienced officers to take charge, it has been held in abeyance until the year under report. A modified scheme was sanctioned last year by the Committee and pending the return of two officers of the Madras Agricultural Department, who have been sent to England for training with a view to conduct the investigations, the preliminary work is being carried out under the general supervision of the Cotton Specialist, Coimbatore. The scheme consists of an investigation into the methods of combating the Cotton Stem Borer (*Pempheres affinis*) which is a major pest in Madras and some other parts of India. This comprises the entomological part of the scheme. The physiological half consists of an investigation into the reasons why the "*borer*" is more prevalent in some varieties of cotton than in others. When the causes have been ascertained it may be found necessary to breed a variety immune to the pest.

BOMBAY PRESIDENCY.

54. *Surat Physiological Scheme.*—This scheme came up for special review in July 1931, having completed three out of its extended period of five years. It set out to discover the causes for the large amount of shedding of buds, flowers and bolls which normally takes place and to discover a remedy, if possible. The chief results up to date may be summarised as below:—

(1) The chief cause of the heavy loss of buds, flowers and bolls is the interaction of the different parts of the plant for the available plant food in the soil, mainly nitrogen, at the time when the heavy flush of flowers appears.

(2) The early application of readily available nitrogen produces a bigger plant but does not reduce the amount of shedding. The increased number of buds, however, on the bigger plant gives a higher yield.

(3) The late application of nitrogen, provided soil water conditions are favourable, causes a larger proportion of flowers to ripen into bolls with an increase in yield.

(4) There is a considerable residual effect of the nitrogen on the succeeding crop which should be taken into account when estimating the advantages of manuring with fertilizers.

(5) Boll shedding is to some extent hereditary and retentive parents should be used for breeding purposes.

The last few years have been devoted to finding practical means of overcoming the natural tendency of the cotton plant to shed its flowers, etc., during growth. Various methods were tried and were rejected. In rain-fed areas, little can be done, except, perhaps, in years of late rain, to supply the necessary deficiency of nitrogen in the soil, but the results should be invaluable in areas where the moisture content of the soil can be controlled, viz., where irrigation is available. The Committee, at its July meeting, decided to close down the scheme at the end of the present cotton growing season and to allow the year 1932-33 to be utilized by the Officer-in-charge for writing up for publication the results of the investigation.

55. *Surat Entomological Scheme.*—This scheme was sanctioned in 1923, was extended in 1928 and closed down at the end of March 1931. The object was to study the life-histories of the *Spotted Boll-worms* (*Earias fabia* and *insulana*) and to devise means for reducing the loss caused by them. The investigation provided a large amount of very important and useful information and when it closed down the Committee sanctioned another scheme, the object of which is to give practical application to the findings of the research. This consists of an intensive cleaning up in a selected area of 480 square miles, immediately after harvest, of all cotton stalks and stubble and the eradication of alternative host plants which harbour the *larvæ* from season to season. In Khandesh, which was surveyed in the hope that it might prove more favourable than Surat for the clean-up measures, it was found that the chief source of carry-over was *Bhendi* (*Hibiscus Esculentus*), which is grown as a vegetable under irrigation in the hot weather. This will prove a formidable obstacle in any attempt to extirpate the pest from this area. The Officer-in-charge of the Entomological scheme is being placed on special duty to collect and make ready for publication all the data acquired during the eight years of the investigation.

56. *Surat Boll-worm Propaganda Scheme.*—In the above paragraph, a short account is given of the Surat Entomological Scheme, its aims and achievements. Before launching the clean-up scheme mentioned in the previous para, the Committee decided to sanction funds for one year's intensive propaganda in the area as it agreed with the Director of Agriculture, Bombay, that there was every danger of failure owing to the tense political situation in Gujerat and because the Department of Agriculture was relatively little known in the tract where the work was to be undertaken. The money was to be spent in demonstrating to the growers in the 480 square mile area that the removal of the boll-worm, by depriving it of its food supply, led to a substantial increase in yield of *kapas* per acre. The best way to convince them of this fact was by ocular proof and it was decided to have cage demonstrations in 40 centres, magic lantern lectures in all the villages and as much discussion as possible. The work was started in April.

57. *The Dharwar Wilt Scheme* was started in 1923 and was extended in 1928 for a further period of five years subject to review at the July meeting in 1931. The first few years of the scheme were devoted to an investigation of the causal organism and an endeavour to find means of checking it. In 1928 when the scheme reached the end of its first sanctioned period, the Committee decided that the breeding of wilt-resistant varieties was the most satisfactory and hopeful means of dealing with the problem and the fresh lease of life given to the scheme was intended to be utilized in this branch of work, though it was not intended to stop the more academic side of the investigation. The Cotton Breeder of the Agricultural Department at Dharwar had in hand several promising strains of wilt-resistant varieties and considerable attention has been paid to testing them during the last three years. Already the Department is distributing the seed of a cross between two previous selections—one of which was a high yielder though susceptible to *wilt* and the other a poorer yielder but immune to the disease. This cross has all the other desirable characters of *Dharwar I*—the susceptible parent—and with the help of a seed distribution scheme financed by the Committee, it is hoped to cover at an early date the whole of this important area with a cotton which will not suffer, as its predecessors have, from the ravages of *wilt*. An intensive crossing programme is being carried on with the intention of finding a strain which is even more remunerative to the grower than the one now being distributed. The Director of Agriculture, Bombay Presidency, convened a Conference in April to discuss the work that had been done up to date on *wilt* and it was decided to suggest that the scheme, as an investigation into *wilt*, should be closed down, that fundamental research into *wilt* should be conducted at some Central Research Institute, e.g., Indore, and that the Committee should finance botanical schemes in wilt-infected areas for the production of wilt-resistant varieties. The Agricultural Research Sub-Committee at its meeting in July decided that the scheme should continue until the end of the present cotton growing season, and that a final decision regarding its future should be made in December.

58. *The Khandesh Cotton Breeding Scheme* completed five years during the year under report. A grant of Rs. 5,000 a year for five years was given by the Committee to enable extra staff, etc., to be employed to give a thorough test to a cross between *Comilla* and *Bani* cottons made many years previously by the Agricultural Department. The cotton has now been thoroughly tested and the proof that it is more profitable to grow than the local mixed cotton or *N. R.* is to be found in the very large area sown by the cultivators without any efforts on the part of the Agricultural Department. The Committee has sanctioned a seed extension scheme for this cotton—*Banilla*—because the cultivator will benefit considerably by growing it in preference to the local cotton or *N. R.* even though it has certain disadvantages, viz., its susceptibility to wilt and a marked deterioration in spinning value since it was first tested. The Director of Agriculture put forward a fresh scheme for this area which aims at breeding a wilt-resistant, high yielding type of cotton with spinning qualities

considerably better than the local *N. R.*, but the Agricultural Research Sub-Committee withheld sanction until an experienced Botanist to take charge of all the cotton work in the Bombay Presidency was appointed. The present scheme was extended till March 1932.

59. *The Sind Physiological Scheme* completed four years during the year under report. The Bombay Government supplies the funds for the botanical and other work in connection with the development of agriculture in Sind, while the Committee provides for physiological investigations on certain problems connected with the water requirements of the cotton plant, dates of sowing and the general physiology of the plant under perennial irrigation. The Barrage is expected to be opened early in 1932 and the Agricultural Department desires to be in a position to instruct the growers on the best time to sow their cotton, the number of waterings and the quantity of water to apply, as well as to have improved varieties ready to distribute.

Central Provinces.

60. *The Central Provinces Research Scheme* started in 1923 and was extended in 1928 for a further period of five years. The scheme set out to obtain a wilt-resistant, higher yielding and better quality cotton for the Central Provinces and Berar, and to investigate the causes of the low yields of cotton in Berar. Before the Committee's grant was given Dr. Youngman had already started to obtain pure lines of the different types of Indian cotton and as the strain which the Agricultural Department has decided to distribute is a pure line selection, much more rapid progress has been possible under this scheme than in any of the other Botanical schemes financed by the Committee. *Verum* 262 is a high yielding, wilt-resistant cotton which spins 20s to 22s against the ordinary Berars 8s to 12s. It has fetched a very satisfactory premium since it was introduced and so great is the demand for it that the Agricultural Department has been compelled to organize a large scale supply of seed for the grower. During the year another very marked step was made in the isolation and development of two new high yielding and wilt-resistant strains of *Verum* 262. One—a late variety—possesses a staple of 1" and is suitable for highest standard warp counts of 30s. For the eastern portion of the Central Provinces and Berar cotton growing tract, which experiences a heavier and later rainfall than the western portion, this late variety has been found to be admirably suited as it is just late enough to escape the damage from boll shedding and bad opening caused by late rains, from which the ordinary *Verum* 262 suffers. A start has been made to distribute the seed of this late strain. The other—an early strain—was isolated to take the place of the "*Jadi*" cotton grown in the Northern and Plateau Districts of the Central Provinces. These districts suffer from early frosts and rapidly drying soils which necessitate an early maturing variety. The early *Verum* selection is meant to replace the mixed "*Jadi*." Two new isolations from *Verum* 262 and *Verum* 264 gin higher than 262 and are suitable for 28s

and 26s standard warp counts. They are being given further trials for yield. The rotational, manurial and spacing experiments were continued, the best spacing for *Verum* having been found to be 18" between the rows and unthinned. A three or four years' rotation having groundnut as one of the crops has given most satisfactory results and a considerable amount of attention has therefore been paid recently to obtaining improved varieties of groundnut and in devising means for lifting it more cheaply. Several improved strains are now available and a special plough has been devised which, in addition to lifting the crop much more cheaply than before, gives the land a preliminary cultivation which should be most advantageous to the succeeding crop. A report on the seed scheme is given elsewhere.

United Provinces.

61. *The United Provinces Entomological Scheme* commenced in 1923 and was extended in 1928 for a period of three years which has now expired. The scheme was sanctioned to work out the life-history of the *Pink Bollworm* (*Platyedra gossypiella*) and to test the known methods of control under the climatic conditions of the United Provinces. For fuller details of the results obtained, last year's report should be consulted. The year's work went to confirm previous results. An area of 27,000 acres was sown with treated seed and it is estimated that the growers obtained an average increased yield of 50 per cent. in addition to a much better price for their produce. The Entomologist to the United Provinces Government has submitted a scheme to his Government which has as its object the heat treatment of all the seed produced in Aligarh District. This entails fitting up all ginning factories with a machine which will heat the seed to 140° F. to kill all the contained *larvæ* without affecting its viability. This scheme is still under consideration and further details will be given in next year's report.

Punjab.

62. *The Punjab Botanical Scheme* commenced in 1925 for the study of the problems connected with cotton growing in the Punjab Canal Colonies. The Committee has provided a Cotton Research Botanist and a grant for special staff and equipment in addition to that provided by the Punjab Government. The American varieties grown in the Punjab suffer periodic "failures" both as regards yield and quality, and considerable time has been spent in trying to find out the causes of these disasters. One method of combating these unfavourable seasons has been to try and obtain a variety which will yield well under the adverse conditions which are unfortunately only too frequent. The Botanist in-charge, Mr. Trought, has succeeded in obtaining an early strain which had every indication of satisfying all requirements.

The chief feature of the year was a severe attack of *jassids* which showed up the susceptibility of the early strain which, it was hoped, would

ultimately take the place of the existing variety—4*F*. The attack of *jassids* was in reality a blessing in that it compelled the workers to concentrate on *jassid*-resistant types which fortunately were available and which would appear to be absolutely essential for the Punjab. The work of multiplying up these resistant types has been taken in hand and they will be tested on a field scale next year. Apart from being tried on several estates scattered over the Punjab, the susceptible early strain has not been given out so that the decision to hold up distribution was a wise one. The importance of giving a thorough test to a new variety before it is distributed for general growth is clearly demonstrated by this experience in the Punjab. The application of a dressing of a quick-acting nitrogenous manure late in the season has been found to increase the yield considerably and even in a year of low prices, as in the one under report, showed a clear profit. The work on root studies has been written up. The root system of the "early strain" is more extensive than 4*F*., has a greater absorbing area and penetrates more deeply. This may account for the better boll opening shown by the early strain in years of "failure" and may have a bearing on its greater resistance to failure conditions.

63. *The Punjab Entomological Scheme* came up for review this year, having completed five years' life, and the Committee decided to renew it for another period of two years to enable the workers to complete the work now on hand. The investigation was started to ascertain the reason for the difference in the incidence of the *Pink Boll-worm* (*Platyedra gossypiella*) between the S. E. Punjab, where it is serious, and the Canal Colonies, where it is negligible. The following conclusions, summarised briefly, have been arrived at :—

(1) Cotton stalks standing in the fields and shed material are not responsible for the carry-over of the pest from season to season. The main sources of infection are stores of seed—particularly those in the villages—and the seed exposed by shopkeepers for sale, as well as the cotton sticks collected for fuel and *patti* in ginning factories.

(2) Under the influence of sun-heat the hibernating caterpillars in the seed, as well as those in dead bolls, are killed, and if seed is exposed to the sun in April and May in a thin layer, every hibernating *larva* is destroyed.

(3) The distribution of *Pink Boll-worm* in the Punjab is far from being uniform. In the South-East it is most serious, and becomes gradually less important towards the Central Punjab and the submontane regions of the North and is of little importance in West Punjab, including the Canal Colonies. Evidence has been collected that this distribution is mainly controlled by the temperature.

(4) In those localities where the attack is serious the emergence of moths occurs mostly during the flowering period. In the other localities emergence takes place much earlier.

(5) The part played by humidity in the emergence of the moth has not been properly worked out though there is evidence to show that it is important.

(6) The longevity of moths is considerable at a temperature of 20° C. but is considerably reduced at higher temperatures. In those places where temperatures of 40°-45° are experienced, the moths may not be able to survive long enough to lay eggs.

(7) The largest number of eggs is laid in the evening between dusk and midnight and the most suitable temperature for oviposition varies between 15° C. and 35° C. Temperatures of 40° or over are unsuitable for oviposition and this factor may be responsible for the absence of this pest in certain localities.

(8) The most favourable temperature for egg hatching lies between 15° C. and 35° C. At higher temperatures hatching is considerably reduced and this may account for the decrease in the number of moths in places where temperatures higher than 40° C. prevail.

(9) The phototropic response of the *Pink Boll-worm* also depends on temperature and this may explain the divergent views of Entomologists regarding the phototropic behaviour of the moth.

64. *The Punjab White Fly Scheme.*—This scheme was sanctioned in the year under report for a period of three years. *White Fly* (*Bemesia gossypipedra*) is a sucking insect which attacks cotton as well as many other cultivated plants, and though opinions differ regarding its share in bringing about the general failure of the American crop in the Punjab, there can be no doubt that it is a serious pest and will repay investigation. Work was started on *White Fly* in 1928 in the Entomological Section of the Agricultural College at Lyallpur and in 1929 one of the Committee's Senior Research Scholars was put on to study the insect at Khanewal. The Committee decided, however, to make a major scheme of the investigation and the following programme of work will be carried out. A considerable amount of information has already been collected during the three years' work at Lyallpur and Khanewal.

I. *Bionomics.*

(*a*) The influence of environmental factors on the life-cycle.

(*b*) Seasonal history; migration from one host plant to another and reasons. Other seasonal activities of the insect.

(*c*) Study of the comparative infestation on different varieties of cotton and on good and bad crop ; influence of irrigation, manure, date of sowing, spacing, etc., on the intensity of infestation.

(*d*) Alternative food plants ; to determine the plants infested at different times of the year and cross inoculation to establish preferences.

II. *Anatomical studies.*

To isolate different varieties or species and to study variations in morphology.

III. *Nature and extent of damage.*

(*a*) Nature of injury caused to leaves.

(*b*) Influence of attack on the vigour of plant.

(*c*) Influence of attack on flower and boll formation, etc.

(*d*) Estimation of total loss caused by *White Fly*.

IV. *Distribution.*

(*a*) Survey of the pest in the Province and distribution in relation to climatic conditions with the object of determining its possible extension to areas at present free.

(*b*) Range of flight.

V. *Control.*

(*a*) Insecticidal methods of control.

(*b*) Agricultural methods of control ; determination of the sources of infestation and effects of clean cultivation, influence of alternative food plants on incidence of attack.

(*c*) Study of the parasites and predators and the determination of their efficacy.

(*d*) Selection of immune varieties and plants.

(*e*) Trials of baits and repellents.

VI. *White Fly as carrier of disease germs.*

To determine if *White Fly* is the carrier of mosaic or causes bacterial disease causing spotting of leaves.

HYDERABAD.

65. *Botanical Scheme.*—In 1929, work commenced at Parbhani on a scheme for the study of the cottons which go to make up *Gaorani* or *Bani* and for the production of a high ginning, prolific and uniform type. Hyderabad is the home of the well-known *Gaorani* or *Bani* which is probably the best of the indigenous cottons. Unfortunately, however, it is a poor producer—both as regards yield and ginning outturn. With selection and crossing it is hoped to obtain a variety or varieties which will yield the growers larger profits than the short-staple *neglectums*. Considerable progress has already been made and the Botanist-in-charge has a large number of selections under observation. Six varieties were grown for multiplication of seed which will be sufficient for sowing 40 acres in the coming season. Bulk selected *Gaorani* will be multiplied on nearly five acres.

66. *Survey Scheme.*—In 1929, the Agricultural Research Sub-Committee recommended that steps should be taken to carry out a detailed survey of the cottons grown in Hyderabad State as an essential preliminary to scientific improvement of the crop and the extension and distribution of the seed of improved strains. The scheme entails the employment of a whole-time man for a period of four years to collect plant types from cultivators' fields all over the State and to test them on the Central Farm at Parbhani. Certain areas will also be very intensively surveyed. The work commenced in June this year.

BIKANER.

67. *Gang Canal Scheme.*—This small scheme commenced in December 1930 and was sanctioned for the purpose of obtaining by selection and hybridization improved types of Indian and American cotton capable of spinning at least 25 counts. In addition, agronomic problems will be studied, such as the best rotation for cotton, the improvement of yield by cultivation, irrigation and the correct adjustment of irrigation water. The erection of buildings and the supply of equipment were completed during the year. Sixty-seven types of cotton obtained from different parts of India were sown in small plots under irrigation and from them suitable selections will be made for further trial.

BURMA.

68. *Cotton Improvement Scheme.*—At its December meeting, the Committee sanctioned a scheme for three years for cotton improvement in Burma. The Agricultural Department there has in its possession three improved cottons and an organization built round the Central Farm at Mahlaing for multiplying up the pure strains. Experience has shown, however, that an amelioration of the cultivators' impoverished condition must be achieved before any conspicuous results can be expected from

efforts to spread the improved cottons. Over a period of five years ending with the 1928-29 season cotton on the Mahlaing Farm averaged 168 lbs. of ginned cotton per acre against an average of 60 lbs. for the district. The intention is to try and introduce into general practice the methods by which these results have been achieved on the Government Farm, viz., the conservation of the rainfall; the storage and utilization of all crop refuse as manure; winter ploughing and early preparation of the land; drill sowing instead of broadcast and the use of intercultivating implements. For this purpose funds and trained demonstrators to concentrate on the cotton problem are necessary, and the Committee's funds will be used to recruit from the students who pass out of the Mahlaing Farm School six demonstrators a year up to a total of 18 in the third year. These will be posted to various centres in the districts and each will be held responsible for the work on three holdings demonstrating better methods of cotton cultivation.

BARODA.

69. *Root Rot Scheme.*—In the sandy alluvial soils of Gujerat, the disease of cotton which does most damage is not *wilt* but *root rot* and the Committee in July sanctioned a scheme put forward by the Director of Agriculture, Baroda, for an investigation into this disease. Sanction has been given for a period of two years in the first place at a cost of Rs. 12,860 in the first year and Rs. 8,860 in the second year. In addition to the investigation into the cause of the disease and control measures, the scheme includes a botanical section with a view to breed resistant varieties which may, as in the case of *wilt*, be the most hopeful line of attack.

CHAPTER IV.

SEED EXTENSION SCHEMES.

70. IN pursuance of the policy decided on at the 1929 monsoon meeting that the Central Cotton Committee would assist Agricultural Departments in the wider distribution of the seed of improved varieties of cotton, the following schemes proposed by Directors of Agriculture were financed during the year :—

71. *Madras.*—As stated in last year's report an irrecoverable grant of Rs. 18,000 spread over a period of five years was sanctioned for the extension and distribution of the seed of improved *Cambodia* cotton. The Committee is holding itself responsible for the pay of an Agricultural Assistant who will act as grader, adviser and business manager to a group of seed societies in the Coimbatore District which grow the selected strains of *Cambodia* and gin and sell the lint collectively. During the year a manager was appointed who joined his duties in the month of September 1931, after training under Rao Saheb C. S. Shirahatti of the Hubli Co-operative Cotton Sale Society.

72. *Bombay Presidency.*—Of the six schemes sanctioned by the Committee in 1930, only three commenced work during the year, those at Athani, Bailhongal and Haveri having been held up till ways and means of financing the purchase of seed were devised.

73. *Hubli.*—A subsidy of Rs. 40,800 over a period of five years was sanctioned to the Hubli Cotton Sale Society, Ltd., in the Dharwar District for the distribution and extension of the improved *Jayawant* cotton. Of the amount of Rs. 6,560 spent during the year, Rs. 3,000 went as subsidy to the Society and the balance to the Department of Agriculture for roguing, etc., to maintain purity. The object of the scheme is to produce and distribute pure seed for 200,000 acres in the Hubli centre. The reserved area under *Jayawant* reached a figure of 16,013 acres and the seed from the whole of this area—13 lakhs lbs.—has been distributed for sowing.

74. *Gadag.*—The Gadag scheme is the same as Hubli in all details except that the cotton dealt with is the improved Upland variety—*Gadag* 1, and the amount of financial assistance given by the Committee was Rs. 7,915 of which Rs. 3,675 went as subsidy to the Gadag Co-operative Sale Society. A reserved area of 23,638 acres was supervised by the Society and by the Officers of the Agricultural Department and sixteen depôts were opened in different centres for the distribution of seed; 12¼ lakhs lbs. of seed were purchased by the Society for distribution in the year 1931-32.

75. *Surat.*—The Committee sanctioned Rs. 2,000 for the pay of a graduate assistant and Rs. 5,000 for the opening of seed depôts for the sale

in the Surat tract of the seed of the improved variety of cotton known as 1027 *A.L.F.* In all twenty-one depôts were opened during the year and they handled 26,97,600 lbs. of seed of which 16½ lakhs lbs. went to the Rajpipla and Chhota Udepur States.

76. *Central Provinces and Berar.*—A grant of Rs. 16,300 for one year was sanctioned for additional staff to supervise the roguing, collection, ginning and marketing of *Verum* 262 cotton. *Verum* seed amounting to 51¼ lakhs lbs. was sold for seed purposes while in addition 31 lakhs lbs. of uncertain purity were sold through private persons. The scheme was extended in July 1931 for a further period of one year.

77. *Hyderabad State.*—Rs. 5,000 a year for three years were sanctioned for the provision of temporary staff to supervise the extension of *Gadag* 1 and *Dharwar* 1 seed in the Raichur and Gulbarga Districts. Over two lakhs lbs. of *Dharwar* 1, half-a-lakh lbs. of *Gadag No.* 1 and 2,000 lbs. of *Jayawant* seed were distributed in sixty villages in an area of over 25,000 acres. *Jayawant* cotton will now replace *Dharwar* 1 in this area because of its *wilt* resistance.

NEW SEED SCHEMES SANCTIONED DURING THE YEAR.

78. *Sind.*—At its December meeting, the Committee sanctioned a grant of Rs. 93,000 spread over three years to be utilized for the extension of improved cottons in the Barrage area in Sind and prior to the advent of perennial irrigation for organizing and carrying out demonstrations, comparative tests and propaganda work to facilitate the extension of improved cottons when perennial irrigation becomes available.

79. *Khandesh.*—In December the Committee sanctioned a grant for the extension of *Banilla* cotton in the Khandesh area of the Bombay Presidency. This cotton, the result of early work by the Bombay Agricultural Department, is extending rapidly on its merits, despite the fact that it is somewhat susceptible to *wilt* and that it has deteriorated in spinning value since it was first tested. Though work is in progress to obtain a more satisfactory strain, the gain to the growers will be considerable if their existing varieties are replaced by *Banilla*, and the Committee agreed to finance a seed extension scheme at an estimated net cost of Rs. 1,60,340 over a period of five years.

RESEARCH STUDENTS.

80. For the more technical aspects of its work, the Committee has had to train its own staff and even for the Botanical Schemes the supply of trained workers was found to be inadequate. For this reason, the Committee set itself to train up, by means of scholarships, a corps of workers in all branches of the industry. Distinguished graduates of Science from Indian Universities and Colleges are placed under the guidance of experienced

investigators working on the Committee's schemes, the Institute of Plant Industry or in the Committee's Technological Laboratory. The scholarships are usually held for two years but extensions are frequently given. Fifty students have been given scholarships, of whom nine are still under training. Five resigned before completing their training and twenty-seven have been taken on the Committee's staff or have joined Provincial and State Agricultural Departments. During the year under report, eight research scholarships were awarded; four in December 1930 and four in July 1931. Five of these were given for the study of Cotton Marketing and Economics. Three completed their training during the year, all of whom received appointments under the Committee. Expenditure under this head during the eight years ending 31st August 1931 amounted to Rs. 1,88,487.

J. H. RITCHIE,
Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1930-31.

I. INTRODUCTION.

THE Technological Laboratory began to function fully in 1924-25 when spinning tests were made on 54 samples of different cottons. Since then there has been no looking backwards; each year saw an expansion in the work of the Laboratory until last year nearly five times as many samples were tested as in 1924-25. During the year under review, from 1st September 1930 to 31st August 1931, not only was there a further and considerable increase in the number of samples spun at the Laboratory, but arrangements were also completed for the testing of cotton samples for their moisture content. The question of moisture in some of the Indian cottons had figured frequently in the deliberations of the Committee and last December the Committee decided to help the Trade in this matter. Accordingly a fully equipped moisture-testing section has been established in the Cotton Exchange, Sewri, where great progress has been made in the direction of collecting reliable data to be placed at the disposal of the Trade. The various activities of the Laboratory during the year under review will now be described under separate heads.

II. SPINNING LABORATORY.

The following statement shows the samples of different cottons received during the year, together with the names of the Agricultural Officers by whom these were submitted :—

BOMBAY.

(1) *Cotton Breeder, S.M.C., Dharwar.*—Eight samples of Dharwar, Jayawant and Cross between Dharwar-Rosea and Dharwar-American; 9 samples of Dharwar, Jayawant and other crosses grown at Dharwar; 2 samples of Cambodia and Gadag.

(2) *Superintendent, Agricultural Station, Jalgaon.*—Four samples of Banilla.

(3) *The Graduate Assistant, Amalner.*—Four samples of Banilla grown in different villages, one sample of BXX1.

(4) *Cotton Breeder, Dhulia.*—Four samples of Banilla cottons.

(5) *District Agricultural Overseer, Erandol.*—Four samples of Banilla.

(6) *Non-graduate Assistant, Pachora.*—Five samples of Banilla.

(7) *Cotton Supervisor, Jalgaon.*—Two samples of Banilla.

(8) *District Agricultural Overseer, Shahada.*—Four samples of Banilla.

(9) *Taluka Development Agricultural Association, Nandurbar.*—One sample of Banilla cotton.

(10) *District Agricultural Officer, Nira Left Bank Canals, Baramati.*—One sample of N. R. cotton.

(11) *Superintendent, Ganeshkhind Botanical Gardens, Kirkee.*—One sample of Banilla, grown at Kirkee.

(12) *Botanist in Sind, Sakrand.*—Eleven samples of different strains grown at the Agricultural Station, Sakrand.

(13) *Cotton Breeder, North Gujerat, Viramgam.*—Six samples of Wagad 8, Wagad Local and other strains, 5 samples of crosses grown at Viramgam, and one sample of Tashkent cotton.

(14) *Deputy Director of Agriculture, South Gujerat, Surat.*—Four samples (one sample each of Jagadia 1027 A.L.F., Selection 1A, Surat 1027 A.L.F. and Cultivator's Surat 51).

(15) *Cotton Breeder, South Gujerat, Surat.*—Three samples of Surat 5, white flower herbaceum and 1A Long Boll; 5 samples of Selection.

(16) *Graduate Assistant, Broach Farm, Broach.*—Four samples of Broach, Desi, Gogharis and Cultivator's Local grown at Broach farm.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—Five samples (3 of N. T., one each of 4F. and 289F.); 4 samples of NT/15/29, early strains, 289F. and 4F.

(2) *B. C. G. A. (Punjab), Ltd., Khanewal.*—One sample of strain 37/29 (early).

UNITED PROVINCES.

(1) *Entomologist to Government, Cawnpore.*—Four samples of J. N. cotton and 4 samples of Selection.

(2) *Assistant Economic Botanist to Government, Cawnpore.*—Four samples of C. 402 cottons and Local (Cawnpore), 3 samples of C. 520 and 1 sample of C. 1031.

MADRAS.

(1) *Superintendent, Agricultural Research Station, Koilpatti.*—One sample of IXC 99.

(2) *Cotton Specialist, Coimbatore.*—Thirty samples of different strains for comparative, manurial and irrigation experiments; two samples of crosses, 4 samples of Rotation and spacing experiments.

(3) *Assistant to the Cotton Specialist, Nandyal.*—One sample of Selection 29.

(4) *Assistant Agricultural Demonstrator, Sattur, S. I.*—Five samples of Karunganni and Pulichai mixtures.

(5) *Agricultural Demonstrator, Koilpatti.*—Five samples of mixtures.

(6) *Farm Manager, Nandyal.*—Seven samples of selection grown in Nandyal.

(7) *Superintendent, Agricultural Research Station, Koilpatti.*—Eleven samples of different strains grown at Agricultural Station.

CENTRAL PROVINCES.

(1) *Economic Botanist to Government, Nagpur.*—One sample of Verum 262A.

(2) *Superintendent, Government Experimental Farm, Akola.*—Two samples of AK-Verum 262 and 264.

MISCELLANEOUS.

(1) *Deputy Director of Agriculture, Shimoga, Mysore.*—One sample of selection 69.

(2) *Agricultural Inspector, Devangere.*—Two samples of Selection 69 and 1 sample of Sannahatti Local.

(3) *Agricultural Inspector, Chitaldroog.*—One sample of Selection 69.

(4) *Agricultural Inspector, Hiriyur.*—One sample of Selection 69.

(5) *Assistant Botanist, Experimental Farm, Hiriyur.*—Two samples of Selection 69 and 69A.

(6) *Superintendent, Government Farm, Parbhani.*—Three samples of Dhulia, Verum and Nagpur Bani.

(7) *Agricultural Officer, Port Blair, Andamans.*—One sample of Sea Island cotton.

(8) *Crop Botanist, Malwa, Ujjain.*—Eleven samples of K. 22, Malvi Local, K. 22, G. 16 and other selections, and 1 sample of Cambodia.

(9) *Superintendent, Agriculture and State Gardens, Dhar State, Dhar.* —Four samples of Verum, Dhulia, etc., grown at Dhar.

A remarkable feature brought out by the above statement is the increasing number of samples received from Indian States. Many of these are now taking an active interest in the improvement of the quality of cotton grown in their territories and for this purpose are making full use of the advantages offered by the Technological Laboratory.

The increase in the work of the Laboratory from year to year is shown in the following tables, which give the distribution of samples, lots and yarns spun since 1924-25.

TABLE I—*Distribution of Samples Spun,* 1924-31.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	Totals, 1924–31
Bombay	18	26	22	22	28	66	89	271
Punjab..	14	1	..	..	42	30	10	97
United Provinces ..	7	..	6	11	9	7	16	56
Madras..	2	19	50	23	30	51	66	241
Central Provinces ..	2	..	3	2	2	5	3	17
Miscellaneous	3	11	..	6	6	27	28	81
Totals ..	46	57	81	64	117	186	212	763
Standard cotton tests .	8	54	49	64	33	34	27	269
Trade Tests	..	..	..	..	..	37	89	126
Total tests ..	54	111	130	128	150	257	328	1,158

TABLE II—*Distribution of Lots Spun,* 1924-31.

Provinces.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	Totals, 1924–31
Bombay	36	52	44	44	53	107	90	426
Punjab..	26	4	..	..	83	41	10	164
United Provinces ..	14	..	12	22	18	14	16	96
Madras..	4	38	100	46	60	85	66	399
Central Provinces ..	3	..	6	4	4	10	4	31
Miscellaneous	3	22	..	12	9	33	29	108
Totals ..	86	116	162	128	227	290	215	1,224
Standard cotton tests .	34	176	142	178	68	64	54	716
Trade tests	..	..	..	..	..	37	119	156
Total tests ..	120	292	304	306	295	391	388	2,096

TABLE III—*Distribution of Yarns Spun, 1924-31.*

Provinces.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	Totals, 1924–31
Bombay	103	152	132	132	159	322	253	1,253
Punjab..	106	14	..	..	254	113	31	518
United Provinces ..	27	..	36	66	54	42	40	265
Madras..	12	108	278	138	180	255	199	1,170
Central Provinces ..	8	..	18	12	12	30	12	92
Miscellaneous	3	58	..	36	27	99	100	323
Totals ..	259	332	464	384	686	861	635	3,621
Standard cotton tests .	95	514	423	447	290	223	309	2,301
Trade tests	..	..	..	..	..	80	343	423
Total tests ..	354	846	887	831	976	1,164	1,287	6,345

It will be seen that during 1930-31 there was an increase of 28 per cent. in the number of samples spun as compared with last year. It will be further seen that in spite of this increase the number of lots spun during the year is practically the same as last year. This apparently anomalous result is due to the fact that on account of the large number of samples received for tests, it is not possible now, as in the past, to spin all, or even most, of them in duplicate lots. For the same reason it was found necessary to reduce the number of yarns spun from a single sample to a minimum consistent with the condition that the number of yarns spun from a single sample was sufficient in any case to give a reliable indication of the spinning value of the sample. These remarks will be clear if we take a specific case. Taking the case of the Bombay Presidency samples, we find that in 1929-30 66 samples, spun in 107 lots, gave 323 yarns, making an average of 1.6 lots and 4.9 yarns per sample. During the current year, on the other hand, out of the 89 samples from the same Presidency only 90 lots and 253 yarns were spun, giving an average of 1.0 lot and 3.4 yarns per sample. It may be mentioned here that with the exception of the standard Indian cottons and cottons for special tests all the other cottons are now spun, in single lot, into three (sometimes two) counts. It is only the adoption of these means which has made it possible to cope with the steady increase in the number of samples tested. Any large increase in the future in this number will have to be met with by increasing the staff and the equipment of the Laboratory. The following table shows the staff employed at the Technological Laboratory from year to year since 1924 :—

As at August 31st in :	1924	1925	1926	1927	1928	1929	1930	1931
Technical staff ..	8	11	20	24	27	27	32	32
Research students ..	1	3	6	4	3	2	1	1
Fumigation supervisors	..	..	2	4	2	2	2	2
Totals ..	9	14	28	32	32	31	35	35

The staff shown above consists of Research Assistants, who are engaged on various research problems, and Junior Testers who do the routine work involved in the testing of samples. An idea of the extent of the work done by the latter may be had by remembering that on each yarn, spun from an agricultural sample, 50 tests are made for lea strength, 50 for actual counts, 100 for single thread strength and 100 for turns per inch. In the case of trade samples the single thread test is replaced by ballistic work of rupture (50 tests) while in the case of standard cottons the number of tests for turns per inch is doubled and the strength is determined by all the three methods. The total number of yarn tests, therefore, made during 1930 amounts to nearly half a million.

Classification of samples.—It will be noticed from the above that the samples tested at the Laboratory fall into three broad divisions, viz., (1) Agricultural samples, (2) Standard cottons and (3) Trade samples. A list of the agricultural samples has already been given on pages 41-44. These consist either of new and promising strains, or of cottons upon which physiological or botanical experiments are being performed in connection with the various research schemes of the Laboratory. They form, by far, the greater proportion of the total number of samples tested. During the year under review 65 per cent. of the samples tested came under this class. The results of tests on these samples are not published for general information but are supplied to the Agricultural Officers and Departments responsible for growing them.

The standard Indian cottons mostly represent the improved varieties grown in different parts of India. The following list gives the names of the standard cottons tested in 1930-31 :—

1. Dharwar 1 (Kumpta).
2. Jayawant (Kumpta).
3. Gadag 1 (Dharwar-American).
4. Surat 1027 A.L.F.
5. Wagad 8 (Dholleras).
6. Punjab-American 4F.
7. Punjab-American 289F.
8. Mollisoni (Bengals).
9. Aligarh A. 19 (Bengals).
10. Cawnpore K. 22.
11. Bundelkhand J. N. 1 (Bengals).
12. Cawnpore-American C. A. 9.
13. (*a*) Nagpur-Verum 262.
    (*b*) Akola-Verum 262.
14. Umri Bani.
15. Cambodia Co. 1 (Cambodia 295).
16. Cambodia Co. 2 (Cambodia 440).
17. Nandyal 14 (Northerns).
18. Hagari 1 (Westerns).
19. Hagari 25 (Westerns).
20. Karunganni C7.

The results of these tests are embodied in a bulletin entitled "Technological Reports on Standard Indian Cottons" which was published in July 1931. Two points should be noted in this connection. In the first place, Punjab-American cotton 285*F*. has ceased to figure in the list of the standard Indian cottons. This cotton has not only given a poor average yield over several seasons but has also been found highly susceptible to climatic conditions and has practically gone out of cultivation. Secondly, in addition to the usual lea strength and single thread results, the results of ballistic tests are incorporated in the bulletin for the first time. In spite of its widespread use the lea test suffers from the defects that it gives no indication of the extensibility of yarn and lays too much emphasis of the weak places. The ballistic test is to some extent free from these defects and it is hoped that when sufficient data is available it will be possible to construct a scale of ballistic work of rupture, similar to the lea-counts scale at present employed.

The testing of Trade samples was taken in hand recently, the first series of tests of this kind being made in 1929-30 on samples representing the average commercial crop as selected by the Standards Committee of the East India Cotton Association. This year tests were repeated on these samples and in addition spinning tests were made on samples of first arrivals of different cottons supplied by various mills through the Millowners' Associations of Bombay and Ahmedabad. The results of these tests on trade samples are published in the form of two-page Technological Circulars which are supplied to the Trade. A list of the circulars published in 1930-31 is given under "Publications." The following statement gives the description of cottons received from these two sources :—

Cottons supplied by the East India Cotton Association.

1. A. R. Kampala.
2. A. R. Busoga.
3. A. R. Jinja.
4. C. P. No. 1.
5. Muttia (Bhavnagar).
6. Khandesh (Dhulia).
7. Berar (Amraoti).
8. Lattur.
9. Nanded.
10. Surat.
11. Broach.
12. Punjab-American (Okara).
13. Jagadia Farm.
14. Navsari.
15. Dhollera Vagadia (Wadhwan).
16. Western Javaria (Adoni).
17. Farm Western (Adoni).
18. Kumpta (Hubli).
19. A. R. Kampala.
20. A. R. Busoga.
21. A. R. Jinja.
22. Kalagin (Manavadar).
23. Bijapore (Bijapur).
24. Bhagalkote (Bhagalkote).
25. Upland (Hubli).
26. Cambodia (Tirupur).
27. Karunganni (Virudnagar).

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

(*a*) *Bombay.*

1. Bengals.
2. Yawal (Khandesh).
3. Ranala (Khandesh).
4. Nimbora farm (Khandesh).
5. Sujalpur (Ujjain).
6. Ujjain.
7. Mandusar.
8. New Broach (Salar).
9. Hubli Kumpta.
10. Hubli Upland.
11. Bailhongal.
12. Hubli-Kumpta.
13. Karunganni.
14. Karnool Cambodia.
15. Nandyal.
16. Surat.
17. Navsari.
18. Cambodia.

(*b*) *Ahmedabad.*

1. Jagadia.
2. Bawla.
3. Kadi.

Technological reports.—During the year under review the number of test reports issued reached the high figure of 101, giving an average of two reports per week. This is in excess of last year's figure by 42 per cent. and almost equals the total for the first five years. The following table shows the nature and numbers of test reports issued from year to year :—

——	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31
Spinning Test Reports ..	7	19	19	22	21	63	92
Fibre Test Reports	1	1	5	1	7	4	7
Yarn Test Reports	..	..	..	1	4	4	2
Totals ..	8	20	24	24	32	71	101

Special agricultural tests.—A special feature of the work on agricultural samples consisted of the tests made on *Banilla* and *Karunganni* cottons. The former cotton has not only given variable results as regards quality when grown in different parts of Khandesh, but has also shown signs of gradual deterioration. The samples of this cotton hitherto tested were mostly those received from the Government Agricultural Farms, where they are grown under optimum conditions. In order to ascertain whether a definite deterioration of type had really set in and, if so, to what extent, arrangements were made to make tests on samples of *Banilla* cotton grown under field conditions in the districts. About 20 samples were received

and tested in the usual manner. These tests have given some very interesting results, but as the matter is of great importance both to the Department and the Trade it has been decided to repeat these tests in the coming year before the results are published for general information. Similar tests were made on *Karunganni* cotton which is now being adulterated by the low quality cotton known as *Pulichai*. Five samples of mixtures commonly passed as *Karunganni* but containing from 16 per cent. to 31 per cent. of *Pulichai* cotton were tested. The best of these samples was found suitable for highest standard warps of 16s only, the average for the five samples being 12s. This compares very unfavourably with the spinning performance of standard *Karunganni* with an average of 24s over seven seasons and shows the extent to which damage can be done by mixing it with an inferior type. As the exact proportion of *Pulichai* cotton in these mixtures was not known and furthermore as no control samples were available this year, the Cotton Specialist, Coimbatore, has been asked to arrange for the supply of mixtures containing known proportions of *Karunganni* and *Pulichai* cottons together with control samples, grown under similar conditions, for tests in the ensuing year. Similar tests were also made this year on mixtures of 289*F*. and 4*F*. grown in the Punjab. The problem of mixing of Punjab-American cottons is an old and difficult one, and hitherto tests have been made on mixtures of Punjab-American and *Desi* cottons. This year this work was extended by making tests on mixtures of two American cottons, the long staple 289*F*. and the medium staple 4*F*. As the area under cultivation of the American cottons in the Punjab increases it is conceivable that the mixing of the two American cottons may also be resorted to in addition to the old malpractice of mixing an American with a *Desi* cotton. The object of these tests is to know beforehand, by performing actual tests, how much lowering of the spinning value of 289*F*. can be expected as a result of its being mixed with known quantities of 4*F*.

TECHNOLOGICAL WORK.

High draft spinning.—There is no doubt that on account of its economical advantages the practice of high draft spinning is bound to grow in India. Last year a bulletin* was published embodying the results of a series of tests on mixings of an American and an Indian cotton using two high draft and the ordinary system of spinning. Since the completion of these tests the Laboratory has acquired a new ring frame manufactured by Messrs. Tweedales and Smalley which is fitted with a 4-roller high draft system on one side and the ordinary system on the other. The work on the high draft spinning has now been extended by completing tests on mixings of two Indian cottons, viz., Cambodia Co. 1 and C. P. Wun, in which all the three high draft systems have been utilized. With these three high

* Technological Bulletin, Series A, No. 15 : "Preliminary Spinning Tests on Mixings of American and Indian Cottons using Ordinary and High Drafts."

draft systems and the ordinary system each of the five cottons were spun in the following nine different ways :—

1. Ordinary system, band drive, single roving, ordinary draft.
2. Ordinary system, band drive, double roving, double draft.
3. Ordinary system, tape drive, single roving, ordinary draft.
4. High draft Ingoldstat system, double roving.
5. High draft Casablancas system, double roving.
6. High draft roller system, double roving.
7. High draft Ingoldstat system, inter roving.
8. High draft Casablancas system, inter roving.
9. High draft 4-roller system, inter roving.

That these constitute a very comprehensive series of tests on high draft spinning will also be seen from the fact that in these experiments some 20,000 yarn-tests were made. These tests have brought to light some very interesting and remarkable results which are now being written in the form of a Technological Bulletin which, it is hoped, will be published soon. Since the completion of these tests another ring frame, kindly presented to the Laboratory by Messrs. Platt Brothers through Messrs. Nowrosjee Wadia & Sons, has been received and erected. This new ring frame is fitted with the ordinary system on one side and the 4-roller C.S.L. high draft system on the other and, like ring frame No. 3, is belt-driven by a variable speed individual motor supplied by Messrs. Asea Electric Ltd. As soon as opportunity permits it is proposed to continue work on high draft spinning in which the new ring frame will also be utilized.

Combing of good quality of Indian cotton.—There is little doubt that as a result of the labours of the Agricultural Officers engaged on cotton breeding and the contributions made by the Committee the area under their cultivation of the improved varieties is steadily expanding with the result that the average quality of the Indian crop is improving from year to year. As the improved varieties are marketed in larger quantities these will be used for spinning into finer counts. In order to give a lead in this matter the spinning performance of Punjab-American 289*F*. after it is combed to the extent of 20 per cent. and 30 per cent., is being examined at the Technological Laboratory. Preliminary tests have shown that under these circumstances 60s and 80s yarns of requisite strength and evenness can be spun. The wastes removed by the comber will be mixed with a suitable cotton and the mixture will also be spun into appropriate counts with a view to give an idea of the expense involved in this process. The tests on 289*F*. are under progress and when they are completed it is proposed to make similar tests on two other long-staple Indian cottons namely *Cambodia* and *Nandyal* 14.

Variable speed motor for the Crighton Opener.—The Crighton Opener was originally fitted with a motor running at a constant speed of 750 revolutions per minute. All cottons, differing widely in their degree of cleanliness and fibre properties, were subjected to the same number of strokes per minute by the beater. This was felt to be rather unfair to such long-staple cottons as were received in a comparatively clean state. The Crighton Opener has accordingly been fitted with a variable speed motor supplied by Messrs. Asea Electric Ltd. which is capable of running at different speeds from 500 to 1,500 revolutions per minute. Tests are now in progress, using fairly dirty samples of *Muttia* and *Kalagin* cottons, with a view to ascertain the minimum speed required to clean such a cotton, and the effects of higher speeds on its spinning performance.

Card settings.—The important function which the card plays in the cleaning and disentanglement of the cotton fibre is well known. There is no doubt that the quality of the yarn spun from a cotton depends not only upon the care which is exercised in carding it but also, to a considerable extent, upon the correctness of the various settings of the carding engine. It is however reasonable to expect that the different settings of the carding engine bear some relationship to the fibre properties of the cotton which is being carded. Settings which are suitable for a long and fine cotton will in all probability be unsuitable for a short and coarse one. The whole problem no doubt bristles with difficulties but it is of such vital importance that systematic work on it is highly desirable. This work has now been taken in hand at the Technological Laboratory. It is realized that it would not be possible to study the effect of changing each of the many card settings; attention is therefore concentrated for the present on the major settings only. In order to cover the normal range of the cottons tested at the Laboratory, the following three cottons have been selected for these experiments.

(1) Short staple, Berars.

(2) Medium, Dharwar-American.

(3) Long staple, A. R. Kampala.

This work is in progress.

III. RESEARCH LABORATORY.

The large increase in the number of samples received for tests at the Technological Laboratory has kept the staff employed in the Fibre-Testing Section fully occupied with the determination of the fibre properties. It will not be perhaps out of place to mention here that each agricultural sample on which a spinning test is made is also subjected to fibre tests which consist of a determination of its mean fibre-length by two methods, i.e., Balls Sorter method (once), and Baer Sorter (twice), and of fibre-weight

per inch for which about 1,000 fibres are weighed. The standard Indian cottons are tested in a much more comprehensive manner as it is hoped that from the knowledge of their various fibre properties it may be possible to predict their spinning value. This would greatly facilitate the work of the cotton breeder and enable him to make tests for himself on handful of lint which will be available in a much shorter time than the minimum quantity required at present for a spinning test. The fibre-properties determined for a single standard Indian cotton are as follows :—

Mean fibre-length : mean of 4 Balls Sorter and 8 Baer Sorter tests.
Mean fibre-weight : average for 2,000 fibres.
Fibre-strength: mean of 300 tests.
Fibre-rigidity : mean of 150 tests.
Convolutions : mean of 150 tests.
Ribbon-width : mean of 150 tests.

Mean fibre-length of African cottons.—The Trade samples are not as a rule tested for fibre properties but this year an advance has been made in this direction by the determination of mean fibre-length for three well-known African cottons, viz., A. R. Kampala, A. R. Busoga and A. R. Jinja. On account of the increasing consumption of these growths in India the East India Cotton Association appointed a Sub-Committee on African cottons with a view to fix suitable standards for them. The Association approached the Technological Laboratory to help them so far as the mean fibre-length is concerned. It was arranged that the East India Cotton Association should supply every month to the Laboratory average samples of these three cottons for a few months and the results of their mean fibre-length determination should be communicated to the Association. These tests are being made as and when the samples are received.

PHYSICS SECTION.

Mr. Kapadia has completed his investigation on the variation of single thread yarn strength with length of specimen and is now engaged on the carding problems to which a reference has already been made.

Mr. N. Hari Rao has, in addition to supervising the work of the Fibre Testing Section, completed his research on the clinging power of cotton which is being published in the form of a bulletin and is now engaged in the study of the effect of twist on fibre strength. His apparatus has been modified with a view to determine simultaneously longitudinal contraction taking place in the fibres when they are twisted.

Mr. Koshal has completed his investigation on the breaking strength of cotton fibres at successive breaks. He is now engaged in an investigation into the variation of fibre-length, fibre-weight and fibre-strength of fibres with respect to their position on the seed. He has practically finished six cottons and his investigation has already yielded some very interesting

results. It is found that the fibre-length of the fibres removed from the base of a seed is appreciably greater than that of the apical fibres, while the reverse is the case with fibre-weight per inch and fibre-strength. It is further found that cottons belonging to different species behave differently in these respects ; the difference in fibre-properties being quite large in some cases and quite small in others. These experiments constitute the first of their kind attempted in a systematic manner and there is no doubt that their results will throw a great deal of light on the structure and the properties of the cotton fibre and on the intricate problems relating to nutrition from different parts of the seed.

Mr. Srinagabhushana has completed his work on the variation in the properties of cotton fibre during the processing of cotton. These experiments have opened up fresh problems and further work will be necessary before the results can be published. He is now employed in studying the variation in rigidity, convolutions and ribbon-width of the fibres taken from the base and the apex of the cotton seed. Like Mr. Koshal's work to which this investigation forms a complementary part, this has also yielded interesting results. It is found that the rigidity of the basal fibre is more than that of the apical fibre while the ribbon-width and the number of convolutions are less. Here again, as in the case of the fibre weight and fibre strength, the differences are very marked in the case of some cottons and not so marked in others. It is possible that the extent to which these differences appear in the properties of fibres belonging to different parts of the seed has some relationship with the well-known seasonal variation of the cottons, a point which can only be considered when results for a sufficient number of cottons are available.

Chemistry Section.—During most of the period under review Mr. Sen has been employed in the moisture-testing section of the Laboratory at Cotton Exchange, Sewree. An account of the work done there will be presently given under a separate head. He has, in addition, completed a determination of the chemical properties of the cotton fibres taken from the base and the apex of a seed. He is at present engaged on a problem which was taken up some time ago at the request of the Trade, viz., the spontaneous combustion of cotton. As will be remembered, a series of experiments were performed with a view to find out whether loose cotton and hessian, when completely saturated with moisture, were capable of producing inflammable gases in sufficiently large quantities. The results of this investigation were presented in a report. The present series of experiments aim at attacking the problem from a different angle. It is proposed to prepare a number of small sample bales with a handpress, the cotton being previously treated so as to represent most of the conditions met with in actual practice. Some of these bales, for instance, will be made from especially dirty cottons containing seed and leaf bits while others will contain small bits of hessian suspended in the mass of the cotton. Some bales will contain small quantities of such unsaturated oils as are given out by the cotton seed under pressure

while others will be prepared from comparatively clean cotton containing water and unsaturated oils in close proximity. Altogether some 28 bales are being prepared. Half of these will be kept outside in the open corresponding to conditions prevailing in a *jaitha* and the other half inside the room which may be taken to represent a godown. A continuous record of maximum and minimum temperature in both the places will be maintained.

Mr. C. Nanjundayya has completed his work on the variation of fibre weight per unit length along the length of a fibre and the determination of unit fibre weight. It is found that it is not correct to suppose that in all cases the fibre weight per unit length is constant along the length of fibre, but that generally it varies, the degree of variation being different for different botanical species of cotton. As a result of this investigation, the old routine method for the determination of fibre-weight per inch, which consisted of weighing portions of fibres each 1 cm. long, has given place to a new method in which whole fibres are weighed and the fibre-weight per inch is determined from a knowledge of their mean fibre-length. This change in the method necessitated the re-determination, both on the new and old lines, of fibre-weight per inch of standard Indian cottons of two seasons in order to establish a connection between the two methods. The results of these tests are being published in the form of a bulletin. He is now engaged in studying the variation in fibre-strength with length-grade of the fibres. He has already finished four cottons and his results show that invariably the strength of a cotton fibre diminishes as its length increases. Although the part played by the strength of cotton fibres in determining the spinning value of the cotton is not so important as that played either by length or fibre-weight, yet it does affect the spinning properties of a cotton, and the results of this investigation when completed will show how far it is justifiable to aim at an increase in the length of the fibres at the sacrifice of a possible decrease in the strength. It is further found that for a certain region of length at least the interesting relationship holds that the product of length and the breaking strength is very nearly constant. This result has important theoretical implications as it shows that the structure of the fibre is much more regular than is generally supposed and that there is an intimate connection between the length of the fibre and the quantity of cellulose deposited in it. The work is under progress.

Microscopy Section.—Since the absence on study leave and subsequent retirement of Mr. H. N. Dutt the work in the Microscopy Section has been done by Mr. A. N. Gulati who received the assistance of a temporary Junior Tester for three months. He has been engaged on a study of maturity of cotton hair with special reference to neppiness. The method adopted at present is as follows :—

Some 30 cottons which had been previously tested in the Laboratory have been selected for these experiments. These cottons were grown under vastly different conditions of climate and environment and gave very different results as regards neppiness. Some of these cottons gave yarns which were either quite free of neps or only slightly neppy while the yarns spun from the

other cottons suffered badly from this defect. Again some of the cottons were available in duplicate lots, one lot being saw-ginned while the other was roller-ginned. The wall-thickness of a sufficient number of hairs of each of these cottons was measured and furthermore these cottons were treated with a solution of caustic soda and the percentage of the swoollen hairs was determined. The results of these two methods serve as a check on one another and both taken together constitute a measure of the degree of maturity of the cotton. The object of this investigation is to ascertain how much of neppiness is inherent in a cotton, how much is caused by climatic and environmental factors and how much is produced by subsequent treatment in the ginning factories.

The preliminary tests have given quite hopeful results. They are now being repeated with a very much improved technique which, it is hoped, will eliminate some of the subjective errors inherent in this kind of research. These experiments will be further supplemented by making spinning tests on saw-ginned and roller-ginned samples of the same cotton. The *kapas* for these tests will be ginned in the two small gins acquired for the Laboratory with the sanction of the Committee.

Variation in the weight of a bale.—The observations on the variation in the weight of cotton bales of different trade descriptions were continued till 25th June 1931 when a cycle of 12 months was completed. These bales were then opened up and small samples of cottons were taken out from each bale according to a special plan which is followed in the Testing House at Barwick (England). The object of following this plan is to make sure that all parts of the bale are fully represented in the samples which are extracted. The moisture content of these samples was determined by two independent methods. Firstly, it was determined by the ordinary method of the conditioning oven and secondly by placing small quantities of cotton from each sample in weighed glass bottles which were kept in partially vaccuated dessicators containing a strong dehydrating substance, phosphorus pentoxide. The second series of experiments took a much longer time than the first but all the results are now complete and will shortly be written up in a report. On account of the fact that last year experiments on these bales were started somewhat late in the season when the humidity was fairly high, it was felt by the writer that a repetition of these experiments including the period which was lost last year would be highly desirable. Accordingly a suggestion to this effect was made to the East India Cotton Association who very kindly agreed to provide one bale each of Broach, Berars and Bengals. These bales have been placed in wire-gauze cages in Godown No. C42 with the kind permission of the proprietors, Messrs. Jamnadas Nursey Ginning and Pressing Factories, Ltd. The bales are weighed regularly once a week and a record of the humidity and the temperature prevailing in the godown is maintained. It is proposed to complete another cycle of 12 months with these new bales after which their moisture content will be determined as explained above. In addition to these tests on fully pressed bales an automatic recording apparatus has been set up with a view to study the variation in weight of small samples of cotton in different stages of compression. For this purpose

a form of thermostat has been devised by means of which it is possible to keep these samples for any length of time in an atmosphere of known and constant humidity. Results are already available for very loose as well as moderately pressed cotton and the experiments are now being made on small sample bales pressed almost to the same degree as the ordinary cotton bale. On account of the high humidity prevailing throughout the monsoon period this work had to be temporarily suspended but will be resumed as soon as atmospheric conditions are again suitable.

Moisture Testing Section.—In accordance with the decision arrived at the last meeting of the Committee a small but fully-equipped moisture testing section has been established in the Cotton Exchange Buildings, Sewri. For this purpose the East India Cotton Association placed two rooms at the disposal of the Laboratory in which two conditioning ovens and other necessary apparatus for the carrying out of moisture tests on samples of cotton have been installed. In the beginning it was thought that the moisture tests will be confined only to such samples as are selected by the Appeal Committee of the Association. It was however suggested by the writer that if these tests are to form the basis of a system of "blind survey" with regard to moisture content of cottons and if the section is to be developed until in the course of time its functions become part and parcel of the activities of the East India Cotton Association, then it was highly desirable that a systematic investigation should be made on the normal moisture content of bales pressed, without any extra humidification, under known conditions of temperature and humidity. The results of such tests would give the minimum moisture content to be expected in bales of different trade descriptions pressed at different places at different times of the year. This proposal was thrashed out by a Sub-Committee appointed by the Board of the East India Cotton Association which finally accepted a scheme submitted by the writer. According to the scheme the Association very kindly agreed to supply 40 bales of cotton, the supply being spread over a period of two months. The following table gives the details of the bales supplied by the Association for these tests :—

Date of Receipt.	Cotton.	Source.	No. of Bales.	No. of samples drawn.
17th March 1931 ..	C. P. No. 1	Warora	4	30
17th March 1931 ..	Berar	Murtazapur	4	30
17th March 1931 ..	C. P. No. II	Dharwar-Motibagh	4	20
27th March 1931 ..	P. A. 4F	Khanewal	4	20
27th March 1931 ..	Mollisoni	Khanewal	4	20
7th April 1931 ..	Broach	Palej	4	20
30th April 1931 ..	P. A. 4F	Khanewal	4	20
30th April 1931 ..	Mollisoni	Khanewal	4	20
6th May 1931 ..	C. P. No.I	Warora	4	20
12th May 1931 ..	Broach	Palej	4	20
		Totals ..	40	220

Excepting the Punjab bales all these bales were pressed in the presence of a member of the staff of the Laboratory who was deputed to go to the pressing factories to take readings of humidity and temperature. Similar readings were also taken by an employee of the B. C. G. A. for the Punjab bales.

In the beginning 10 representative samples were drawn from each bale but with the results of 40 such samples in hand it was found that a degree of accuracy sufficient for the purposes of the Trade could be attained by reducing the number of samples to 5. Each bale was carefully weighed on its arrival in Bombay and just before the drawing of samples. From a knowledge of the total weight of cotton taken from a bale, its moisture content and the weight of the bale, the moisture content of the whole bale can be readily calculated. All these tests have been completed and the report is being placed before the East India Cotton Association for their consideration.

In addition to the testing of these samples Mr. Sen has tested 64 samples selected by the Appeal Committee of the Association. The tests on the latter kind of samples are still being made as and when these are received from the Appeal Committee. The total number of tests made in the Moisture Testing Section up to date is 334.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins and Circulars issued during the period under review :—

I. Technological Bulletins, Series A, Nos. 17 and 18 :—

(1) Series A, No. 17, November 1930, Limit-Spinning Tests on Cambodia and Mollisoni Cottons, by A. James Turner, M.A., D.Sc.

(2) Series A, No. 18, July 1931, Technological Reports on Standard Indian Cottons, 1931, by Nazir Ahmad, M.Sc., Ph.D.

II. Technological Bulletins, Series B, Nos. 11-13 :—

(1) Series B, No. 11, October 1930, Random and Systematic Selections of Warp Specimens in Cloth Sampling, by A. James Turner, M.A., D.Sc.

(2) Series B, No. 12, November 1930, A Study of Comparative Results for Lea, Single Thread, and Ballistic Tests on Yarns from Standard Indian Cottons, by A. James Turner, M.A., D.Sc., and V. Venkataraman, M.A.

(3) Series B, No. 13, November 1930, The Determination and Variation of Twist in Ring-spun Cotton Yarns, by D. F. Kapadia, B.Sc.Tech., B.A., and A. James Turner, M.A., D.Sc.

III. Technological Circulars Nos. 35-58, as under:—

Circular No.	Cottons.	Date of publication.
35	Bengals	November 1930.
36	Verum 262 (Akola), 1930-31 (Standard)	December 1930.
37	A. R. Kampala, A. R Busoga and A. R. Jinja, 1929-30	"
38	Verum 262 (Nagpur), 1930-31 (Standard)	"
39	Khandesh	February 1931
40	Ujjain	"
41	Umri Bani, 1930-31 (Standard)	"
42	Punjab-American 289F. (Standard)	March 1931.
43	Punjab-American 4F. (Standard)	"
44	C. P. No. I, Muttia, Khandesh and Berar	"
45	Lattur and Nanded	"
46	New Broach (Salar)	"
47	Jagadia, Bawla and Kadi	"
48	Hubli Kumpta and Hubli Upland	April 1931.
49	Surat and Broach	"
50	Bailhongal and Hubli Kumpta	May 1931.
51	Punjab-American, Jagadia Farm, Navsari	"
52	Karunganni and Kurnool Cambodia	June 1931.
53	Nandyal	"
54	Surat, Navsari and Cambodia	"
55	Dhollera, Westerns, Farm Westerns and Kumpta	July 1931.
56	A. R. Kampala, A. R. Busoga and A. R. Jinja	August 1931.
57	Kalagin, Bijapore and Bhagalkote	"
58	Upland, Cambodia and Karunganni	"

Reference has already been made to new features of Technological Reports on Standard Indian Cottons, 1931 ; the following are the summaries of the other bulletins :—

(1) *Series A, No. 17, Limit-Spinning Tests on Cambodia and Mollisoni Cottons.*—Tests have been carried out to explore the possibilities of spinning Cambodia Co. 1 (295) (1927-28), and Mollisoni (1925-26) from carded single rovings at much higher counts than they are usually spun at the Technological Laboratory. The Cambodia cotton was spun into 12 different counts, 20s rising by four counts at a time to 60s, and also 70s counts ; each count was spun with six different twist-constants, $3\frac{3}{4}$ to 5, rising by $\frac{1}{4}$ at a time; and the Mollisoni into six different counts, 6s, rising by 2 counts at a time to 16s, each count except 16s being spun with five different twist-constants 4 to 5, rising by $\frac{1}{4}$ at a time, the 16s being spun with twist-constants 4 and 5 only. Full details are given of the machinery used—hanks, drafts, settings, speeds and twists. Particular attention was paid to the behaviour in spinning, and a record made of the number of yarn-breakages in the ring frame ; observations were also made of the evenness and neppiness of the yarns ; and in one appendix are given the Spinning Master's reports, and, in another, the mean test-results obtained for lea, single thread, and ballistic tests.

In the course of this investigation the following numbers of tests have been made :—

	For Cambodia.	For Mollisoni.
Lea strength and counts ..	6,900	1,400
Single thread strength, extension and counts	13,800	5,400
Ballistic work of rupture and counts	3,700	1,700
Twist	13,800	5,400

From the tests on these cottons the following conclusions are drawn :—

(1) Cambodia Co. 1 (1927-28) may be spun from carded single roving up to 52s without too frequent bad-spinning troubles, provided a twist-constant of not less than 4.5 be used, and even up to 60s with a twist-constant 5. The yarn at these limiting counts is very weak, however, and very uneven.

(2) Mollisoni cannot be spun above 8's counts if bad-spinning troubles are to be avoided, and even at this count the twist-constant employed must not be less than 4.5.

(3) As is to be expected, for a given twist-constant the unevenness of yarn increases with the fineness of count, while the influence of twist on evenness is practically negligible.

(4) Contrary to expectation, for counts of yarn up to 40s, the number of neps per yard does not decrease with decreasing coarseness, probably because small nep nuclei may lie hidden in the coarser counts.

(5) The lea count-strength product for a given twist-constant falls as the fineness of count increases ; the maximum such product for any one count of Cambodia is usually obtained by using one or other of the twist-constants 4.25 or 4.5, but with Mollisoni in every count the highest such product is obtained by using the highest twist-constant of the series, viz., 5.0.

(6) The single thread count-strength product for a given twist-constant falls as the fineness of count increases ; for the lower counts of Cambodia (up to 36s) and for all counts of Mollisoni, the highest such product is obtained by using the highest twist-constant of the series, viz., 5.0.

(7) The ballistic count-work product for a given twist-constant falls as the fineness of count increases. For practically every count both for Cambodia and Mollisoni the highest count-work product is obtained by using the highest twist-constant of the series, viz., 5.0.

(8) The single thread extension, for a given twist-constant, gradually decreases as the counts become finer; and for a given count, increases as the twist increases.

(2) *Series B, No.* 11, *Random and Systematic Selections of Warp Specimens in Cloth Sampling.*—This note discusses the relative merits of systematic and random methods of selecting warp specimens from a sample of fabric, when both selections are made on the Latin-square principle. Reasons are given for the belief that the distribution of specimens in the fabric itself is already random, so that the random selection would only show to advantage in the particular case of the random distribution where the specimens were arranged periodically, and where, moreover, the periodical selection by the systematic method happened to coincide with the periodical arrangement. A comparison of the methods of sampling is made in the case of three fabrics—two cottons and one linen; from each of these fabrics 256 warp specimens had been taken, 16 from each of 16 adjacent warp strips, and tested for strength; an analysis of the strength-values shows that, for these three fabric samples, the random selection does not lead to any better results than the systematic, thus supporting the conclusion arrived at from purely general considerations. At the same time it is recognized that from a purely theoretical point of view the random method of selection retains its superiority, and that it is therefore better to adopt the random method unless there are cogent practical reasons for adopting the systematic method.

(3) *Series B, No.* 12, *A Study of Comparative Results for Lea, Single Thread, and Ballistic Tests on Yarns from Standard Indian Cottons.*—It is pointed out that while the lea test suffers from the disadvantages that in practice yarn is seldom treated in lea or hank form, and that the test-results are difficult to interpret, it has three great advantages in (1) being popular, (2) involving a comparatively small sampling error, and (3) providing the specimens required for the determination of counts. The single-thread test suffers from none of the objections to the lea test, and, moreover, it yields a result for the extension of the yarn; but, as ordinarily carried out, it involves a much greater sampling error. The advantages claimed for the recently developed ballistic test are also examined, reference being made more particularly to the work of Lester, and Midgley and Peirce. In the comparison of the lea and single-thread tests reference is made to the work of Bowman, Gegauff, Corser and Turner, G. R. Smith and W. J. Hall.

The testing of the standard Indian cottons has provided an opportunity of comparing the three methods of testing on an extensive scale. Results are available for 22 cottons of 1926-27, 1927-28, 1928-29 and 1929-30. The total number of tests made was 20,700 for lea strength and counts, 20,700 for ballistic work and counts, and 82,800 for single thread strength and counts. The ballistic tests have been made in two series, one with the ends of the lea free to move round the fixing rods, and the other with the ends fixed.

The results for the various tests are discussed in the form of their ratios to one another. The ratio of lea count-strength product to ballistic count-work product varied from 0.32 for 6/10s to 0.51 for 20/40s when the lea ends were free to move; and from 0.41 for 6/10s to 0.63 for 20/40s when the ends were fixed. These differences for various counts are due chiefly to differences in yarn-extension, although the degree of the twist also appears to be a factor of importance. The higher counts give slightly lower values for the ratio of lea count-strength product to single-thread count-strength product, but no general rule is deducible. The ratio of the single-thread count-work product to the ballistic count-work product is also variable but is distinctly higher when the lea ends are fixed in the ballistic tests, under which conditions it ranges from 0.87 for 6/10s to 0.79 for 20/40s. The irregularity of the results is decidedly less for the ballistic test than for the lea test, but much greater for both than for the single-thread test, when due allowance is made for the difference in the numbers of threads tested; the greater regularity of the results obtained by the ballistic test is somewhat discounted by the fact that they are much more affected by changes of humidity.

The three methods of testing are also compared by placing the staple cottons of each season in their order of rank according to each test. It is found that all the tests agree fairly well together, but whereas the differences between the lea strength and single thread strength results are negligible, the differences between the ballistic strength results and those of the other tests are more serious.

The conclusion is finally reached that though there is not sufficient evidence available at present to justify a recommendation that the lea test should be discarded in favour of the ballistic test, yet the latter is a good test of yarn and worthy of a much more extended examination.

(4) *Series B, No.* 13, *The Determination and Variation of Twist in Ring-spun Cotton Yarns.*—In the present paper it is pointed out that the determination of twist in single cotton yarn is a matter of considerable difficulty, especially when the yarn has been spun from a short-staple cotton. Large numbers of tests have been made on single yarns by the usual method of removing the twist in a Standard Twist Tester.

A new method of twist testing is described which consists of passing two single yarns between the front rollers of the ring frame and spinning in the usual way, so that the total doubling twist is substantially the same as in an equal length of single spun yarn. Twist tests on twofold yarns can be made with very great accuracy, using 10-inch lengths, and this method has therefore been employed for the purpose of investigating the variation of twist throughout the bobbin, and also for ascertaining if the variation of twist is affected by the variations in the winding-on tension or by variations in counts.

In an appendix some results are given of certain observations on the relation between the spindle speeds as observed by means of a tachometer and as calculated from the front roller speed, also measured by a speed indicator.

The experiments have been carried out on Punjab-American 285F. spun into single yarns of 20s, 30s, and 40s counts, and also made into two-fold grandrelle yarns of 2/40s, 2/60s, and 2/80s counts. The results of a large number of other tests on the standard Indian cottons have also been analysed in arriving at the conclusions, which are as follows :—

(1) When single yarns are tested for twist by the ordinary method it is necessary to make at least 100 observations on 1-inch lengths in order that the odds may be 5 to 1 that the mean value is correct within 2 per cent. on either side of the mean.

(2) When a grandrelle yarn is made above a single yarn on the same bobbin by doubling together two single yarns under the same spinning conditions as those employed in the spinning of the single yarn, only ten determinations of twist in 10-inch lengths need be made on the grandrelle yarn in order that the odds may be 10 to 1 that the mean value is correct within 2 per cent. on either side of the mean.

(3) The practice at the Technological Laboratory of making ten tests on the grandrelle yarn spun at the top of each of ten bobbins enables the checking of the correctness of the twist wheel to be carried out to a very high degree of certainty.

(4) While the insertion of twist leads to a contraction of the yarn during spinning, this may be partly offset by an extension due to the effect of the winding-on tension.

(5) In calculating the twist per inch in the yarn from the " constant dividend " for twist, the allowance which is made for the thickness of the spindle bands and band slippage should be 8.5 per cent.

(6) Any effect on the twist per inch of a difference in the winding-on tension at the apex and base of the chase appears to be completely masked by irregularities due to other causes.

(7) Very little variation should exist in the total twist of successive long lengths of yarn wound on the bobbin ; where such differences do exist they indicate the existence of variation either in the winding-on tension, or in the spindle-band tension during spinning.

(8) The variation of twist in successive 6-inch lengths of yarn is chiefly conditioned by the variation of count along the yarn.

V. GENERAL.

Visit of the Hon'ble Member in charge of Education, Health and Lands.—On Thursday, the 16th April 1931, the Hon'ble Sir Fazal-i-Husain kindly paid a visit to the Laboratory. He was received by the Secretary, Indian Central Cotton Committee, and the writer who took him round the different sections of the Laboratory. After seeing the Laboratory he discussed various problems arising out of the work done and was pleased to signify his general approval.

Staff.—The staff of the Laboratory on 31st August 1931 was as follows :—

Director.—Nazir Ahmad, M.Sc., Ph.D.

Research Laboratory.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc.; Ram Saran Koshal, M.Sc.

Temporary Research Assistants.—C. Nanjundayya, M.Sc.; Srinagabhushana, B.Sc.

Junior Testing Assistants.—S. S. Sukthankar, L.T.C.; K. G. Deo; H. B. B. Joshi, B.Sc.; K. S. Marar, B.A., LL.B.; R. G. Panvalkar, B.Sc.; S. Samson, B.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc.Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Instrument Maker.—Moreshwar M. Patke.

Spinning Laboratory.

Spinning Master.—R. P. Richardson, F.T.I.

Senior Research Assistant—

(Assistant Technologist)—D. F. Kapadia, B.Sc.Tech., B.A.

Yarn Testing Section :—

Statistician.—V. Venkataraman, M.A.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—B. P. Jain; M. T. Sundaram.

Draughtsman.—B. G. Mehta.

Dr. A. James Turner left on 6th December 1930 for England on preparatory leave prior to retirement, leaving the Laboratory much poorer by his departure. The writer officiated till the 31st March 1931, when he was appointed to succeed Dr. Turner as Director.

Mr. H. N. Dutt was on study leave in the United States from 4th August 1930 to 3rd May 1931. On his return to India he was suspended pending a decision by the Standing Finance Sub-Committee for gross disobedience and failure to submit reports during study leave. The Finance Sub-Committee after duly considering his case decided to terminate his services.

Mr. Srinagabhushana on the termination of his research studentship, on 17th January 1931, was appointed Temporary Research Assistant in the Laboratory, as from 18th January 1931.

Junior Testers.—Messrs. V. V. Apte and K. M. Samant were appointed as Temporary Junior Testers for a period of three months and two months respectively.

Mr. Sassoon Samson was appointed as a Junior Tester from the 25th August 1931 in the place of Mr. P. H. Sharma who resigned on the 22nd August 1931 to take up an appointment in the Indian Railway Service.

Preparation of exhibits.—It was suggested by the Indian Trade Commissioner in London, that the Indian Central Cotton Committee should send some exhibits of Indian cottons to be shown at the Cotton Exhibition at the White City, London. This suggestion was approved by the Committee in its last general meeting. Accordingly a large number of exhibits consisting of Baer Sorter patterns, Halo-patterns, card-slivers, yarn-bobbins, yarn-knots, etc., were prepared from six standard cottons and sent to the Trade Commissioner. The following list gives the distribution of these exhibits :—

1. Surat 1027 A.L.F.
2. Cambodia Co. 1.
3. Verum 262.
4. Jayawant.
5. Punjab-American 4F.
6. Punjab-American 289F : (*a*) Carded.
   (*b*) Combed.

From each cotton the following exhibits have been prepared :—

(1) Six combed seeds fixed on black cardboard pieces ruled in inches and centimetres, to show the halo-length of the cotton.

(2) One Baer Sorter pattern on black velvet, framed, and covered with a ruled glass plate, to show the frequency distribution and the modal length of the lint.

(3) *Card slivers.*—These were in two portions. Portion (1) was in a small wooden box with a glass cover and was meant only to give an idea of the cleanliness, appearance, etc., of the sliver. Portion (2) was contained in a card board box with a small hole in the middle of the lid out of which the sliver could be pulled out and tested by the visitors.

(4) *Yarn bobbins.*—These were also in two portions. Four bobbins of each cotton were permanently fixed in a wooden box with glass cover to show the cleanliness, general appearance, etc., of the yarn. The other four bobbins, which were loose, were meant for the visitors to test the yarns for evenness, neppiness and strength. There were three such boxes containing bobbins of 3, 2 and 1 cottons respectively.

(5) *Yarn knots.*—These were also in two portions. One knot of each cotton was fixed in a wooden case with glass cover. A little label was put underneath each knot showing the counts, test, turns per inch, and their front roller speed and diameter. Another knot of each cotton was sent loose for the visitors to examine.

(6) Black serrated winding cards (one for each cotton) on which the samples of yarn were wound to show the evenness and neppiness of the yarn.

Examination of Mohenjo-daro specimens.—Specimens of an ancient relic wrapped in some unknown fibre was received from the Superintendent for Exploration, Archæological Department. These were carefully and thoroughly examined and after a great deal of search some cotton fibres were found adhering to them showing that the fabric was made of cotton. A report on these specimens was sent to the Superintendent for Exploration.

Alignment of machines.—During the erection of the variable speed motor on the Crighton Opener advantage was taken of the temporary stoppage of work in the Blow-room (which had been anticipated and to meet which a large number of scutcher laps had previously been prepared) to align all the machines in this room. On account of the gradual sagging on the floor, at certain points, some of the machines had gone out of alignment. The alignment was done very carefully and now all the machines are running in excellent order. The same was done to the two cards. When the rush of samples is somewhat less it is proposed to align the fly frames and the ring frames as well.

EQUIPMENT.

Apparatus.—The following apparatus and machinery were acquired for the Laboratory during the year :—

(1) *Yarn Examining Machine.*—For winding varns on cards, new model, with an automatic spreading motion, supplied by Messrs. Henry Baer & Co., Zurich. It will be recalled that a sample of each yarn spun in the Laboratory is wound on a black serrated winding card and preserved for future reference. Hitherto this was done by hand involving the expenditure of much time, which will now be saved by the use of this machine.

(2) One Electric Blower and Vacuum Pump, and one Cenco Hyvac Pump manufactured by Messrs. Central Scientific Co., Chicago.

(3) One Amtex Humidifier manufactured by the American Moistening Company, Providence, R.I. The Spinning Laboratory has, from the beginning, been fitted with a Carrier Humidifier for keeping the humidity constant in the spinning and the yarn-testing rooms. The need for a similar arrangement, on a small scale, in the Research Laboratory had been felt for some time past. As many properties of the cotton hair are highly susceptible to humidity, important investigations have to be either temporarily suspended or spasmodically carried out according to the atmospheric conditions. The humidifier which has now been installed in one of the rooms of the Research Laboratory is capable of maintaining the space inside the room at any constant humidity.

Machinery.—(1) Ring Frame, 48 spindles, fitted with a 4-roller C.S.I. High Draft system on one side and the ordinary system on the other.

(2) Variable speed motor for the Crighton Opener.

Reference to these two items has already been made in the section dealing with the Spinning Laboratory.

(3) Patent Hand Power Macarthy Cotton Gin, 12 ins. wide, with moving seed grid, manufactured by Messrs. Platt Bros. & Co., Ltd., Oldham. The gin has been purchased in accordance with the decision of the Committee and in connection with the proposed work on the nappiness of cotton. An order has also been placed for the same purpose for a Hand Power Saw Gin, made by the same makers, having 16 saws, 8 ins. in diameter with condenser.

Future work.—A programme for future work at the Laboratory was placed before the Technological Research Sub-Committee at its last meeting. After due consideration and approval by the Sub-Committee the programme was finally sanctioned by the Committee. The various researches outlined in the programme are being undertaken as and when the testing of routine samples permits.

VI. ACKNOWLEDGMENTS.

My thanks are due to the office-bearers of the Indian Central Cotton Committee for many valuable suggestions, to the East India Cotton Association for the kind supply of bales for moisture tests and to the members of the staff of the Technological Laboratory for their loyal co-operation and help in carrying out the tests.

NAZIR AHMAD,

Director, Technological Laboratory.

15th October 1931.

APPENDIX I.

LIST OF RESOLUTIONS.

" The Central Cotton Committee desires to place on record its high appreciation of the work of Dr. Turner during the last seven years. In this short period he has trained up a highly technical staff and brought to a very high state of efficiency the Committee's Technological Laboratory. The Committee wishes him every success in the important post which his abilities have secured for him."

" That the Government of India be requested to appoint under Section 4 (*xi*) of the Indian Cotton Cess Act a member nominated by the Karachi Indian Merchants' Association for a period of three years. The representation of the Karachi Joint Cotton Committee will be considered by the Committee when this body becomes a duly constituted association."

" The Central Cotton Committee desires to mark its appreciation of the action taken by the Government of India in drawing the attention of Local Governments and Administrations to the delay in the publication of the all-India Cotton Forecasts and to the undesirability of publishing provincial forecasts before the all-India Cotton Forecasts and also for the arrangements made for their simultaneous publication in different centres in India."

" The Central Cotton Committee approves of the memorandum submitted by the Local Sub-Committee to the Committee appointed by the Bombay Government to make recommendations for the amendment of the Bombay Cotton Contracts Act of 1922."

" The Indian Central Cotton Committee regrets that whilst the Government of India are unable to accept its suggestions for the assistance of the cotton growers on the lines indicated in the Committee's correspondence with Government, Government have not been pleased to put forward any alternative scheme to afford help to them at this juncture.

The unprecedented fall in the price of cotton and all other agricultural produce has brought to a miserable condition the great mass of cultivators who always have the greatest difficulty in making two ends meet. In the opinion of the Committee it is necessary for Government to take some effective action to assist the cotton growers of India to surmount the difficulties with which they are faced.

The Committee, in particular, wishes to urge upon Government the necessity for an immediate and substantial reduction in railway freights on cotton in order that the benefit of such reduction may reach the grower."

" The Central Cotton Committee approves of the action of the Local Sub-Committee in drawing the attention of the Government of Madras to the need for legislative action to stamp out Pulichai from the Karunganni area."

" The Central Cotton Committee desires to express its appreciation of the action taken by the Liverpool Cotton Association, Ltd., in adopting a Contract for Indian Cottons in Liverpool, thus giving effect to frequent representations from this Committee which started in 1923."

" The Central Cotton Committee wishes to place on record its appreciation of the action of the Bombay Government and the Durbars of the Indian States concerned in declaring the Nerbudda-Mahi area a protected zone under the Cotton Transport Act."

" The Central Cotton Committee wishes to thank the Bombay Government for accepting its recommendation to increase the number of cotton growers' representatives on the Sind Cotton Committee."

" The Central Cotton Committee desires to draw the attention of the Government of India to paragraph 261 of the Report of the Indian Cotton Committee (1919) in which the suggestion is made that the Central Cotton Committee might compile and publish the all-India Cotton Forecasts. The Committee requests the Government of India to implement that suggestion as it considers it is the proper body to undertake such work."

" That the report of the Standing Finance Sub-Committee be adopted and that the Government of India be requested to sanction a refund of eight annas a bale on American cotton fumigated in the financial year ending 31st March 1931."

" That the President, Vice-President and the Secretary be appointed to represent the Central Cotton Committee on the Board of Governors of the Institute of Plant Industry, Indore, with power to co-opt a ny member or members of the Standing Finance Sub-Committee in the event of one or more of the nominees being unable to attend any meeting of the Board."

" The Central Cotton Committee wishes to record its appreciation to the Government of India for consenting to reduce the fees for the fumigation of round bales of American cotton."

" The Central Cotton Committee wishes to thank the Government of India for acceding to the request of the Local Sub-Committee asking Local Governments to expedite the returns of cotton consumed in mills."

" In view of the difficulty of carrying out an investigation into the cost of production of a single crop, and the fact that this Committee deals only with cotton, the Central Cotton Committee requests the Imperial Council of Agricultural Research to undertake an investigation into the cost of production of the principal crops in the different Provinces and States of India."

" I. That the case be sent back to the Director of Agriculture, Bombay, with the request that he will lay down comparative experimental plots of 1027 A. L. F. and 1A cottons on :—

(*a*) experimental farms,
(*b*) the lands of representative holdings of ordinary cultivators, scattered throughout the area under consideration,
(*c*) that notes of purity of the type, size and shape of the plots, repetitions and other data which will help new interpretations of the results be noted,
(*d*) this experiment be carried out for two years and reported on to this Committee along with the spinning tests of fibre from the experimental plots and with the results of past tests.

II. That he will collect information to show whether in the region in question there are :—

(*a*) differences in quality of soil,
(*b*) differences in methods of cultivation, or
(*c*) other factors which are sufficient to cause difference in price of the fibre such as those shown in columns 2 and 4 of Statement III.

III. That the Ahmedabad and Bombay Millowners be requested to submit their views on this subject to the Indian Central Cotton Committee."

" In spite of the assurance of the Government of India that the classification of the Committee's grants in the accounts of a Local Government is purely a matter of form, the Central Cotton Committee views with grave concern the ruling given by the Chief Controller of Civil Accounts to certain Governments that the Committee's funds should be merged into provincial revenues as it regards this ruling as a direct contravention of the decision given in the Government of India's letter No. 755, dated the

25th June 1923, since which time all grants have been given under this understanding. The Committee respectfully requests the Government of India to make provision for excluding the Committee's grants from provincial revenues as has been done in the past."

" That the Notification No. 1213-Agri., dated the 27th May 1930, should be amended so as to allow any person to import through the officers specified in Schedule 2 any quantity of seed up to 9 cwts."

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE.

**Annual Report for the year ending June 30th, 1931.*

I. Administration and General.

1. *Introduction.*—The lamentable and premature death on the 18th August 1930, of Mrs. G. L. C. Howard, deprived the Institute of Plant Industry, and indeed the scientific world, of one of its most brilliant and prolific workers in her particular field. Her work on the science of agriculture with that of her husband, always published in association, is a permanent memorial.

The retirement in April 1931 of Mr. Albert Howard, the first Director of the Institute, after 27 years of service for Indian Agriculture, was a second heavy loss to the Institute. His ripe experience and almost intuitive knowledge of crop plants were assets of enormous value to which the successes achieved by the Institute give clear testimony.

After his departure his Personal Assistant, Mr. M. L. Saksena, L.Ag., took charge of the Institute for a short time and was succeeded by Mr. P. H. Rama Reddi, M.A., B.Sc., pending the arrival of the newly appointed Director, Mr. F. K. Jackson, N.D.A. (Hons)., Dip. Agri. (Cantab.), who had been Director of Research in the Department of Agriculture in Iraq. The work of the Institute was efficiently carried on but, naturally, no fresh work or change in policy was inaugurated.

2. *Local contributions.*—When this Institute was started in 1924, it was hoped that the initial financial support voted by the Central Cotton Committee would, in the course of time, be followed by an increase in the local contributions. This has occurred ; the two important States of Orchha in Central India and Bharatpur in Rajputana having become members during the year. In 1924, eight Central India States with a total annual contribution of Rs. 20,800 joined the scheme. To-day the number of Contributing States has increased to twenty, as follows :—

Indore, Dhar, Jaora, Datia, Rutlam, Dewas (Senior), Sitamau, Narsingarh, Tonk, Bijawar, Barwani, Jhalawar, Bikaner, Rewa, Jaipur, Bundi, Partabgarh, Baghli, Orchha and Bharatpur.

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* This report with the exception of the Introduction is a combination of the one written by Mr. A. Howard for the period July-December 1930 and that of Mr. P. H. Rama Reddi covering December-June 1931, both of which have already been laid before the Indian Central Cotton Committee. These have merely been edited and re-arranged and the views and opinions expressed are in the main those of the authors and not necessarily of the undersigned.—F. K. Jackson.

Their total annual contributions amount to Rs. 47,550—an increase of 130 per cent. During the same period the annual subsidy of the Central Cotton Committee has been raised from Rs. 1,00,000 to Rs. 1,15,000—an increase of 15 per cent.

3. *Benefactions.*—A very valuable and a very princely benefaction has recently been received from His Highness the Maharaja Holkar of Indore. The bungalow (including the outbuildings and compound) now occupied by the Director has been placed at the disposal of the Institute for a period of ten years at a nominal rental of Rs. 12 per annum. The book value of this property stands at Rs. 1,15,000. There is little doubt that ten years hence, provided the Institute continues to prosper, this valuable property will be made over to the Society by the State Authorities.

A further benefaction made by His Highness, which indicates the keen interest taken by the Holkar State in the Institute, is the handing over of an area of land (about 4.25 acres) adjoining the Institute for the purpose of establishing a *permanent cultivators' camp so that visitors of the cultivator class can always be accommodated and so enabled to see at their leisure and absorb the improved methods which have been worked out for them. This area has been made over on the same terms as the rest of the land occupied.

Negotiations are in progress in connection with three other similar benefactions which will make the Institute a self-contained unit and which will complete its organization as at present planned.

4. *Board of Governors.*—The Board met thrice during the year, on 9th January 1931. 28th March 1931 and 26th April 1931, primarily for selecting a new Director for the Institute, and decided finally to appoint Mr. F. K. Jackson, N.D.A. (Hons)., Dip. Agri, (Cantab.), formerly Director of Research in the Department of Agriculture, Iraq. He arrived in India on July 17th.

The following members attended the meetings :—

Hon'ble Lt.-Col. R. J. W. Heale, C.I.E., O.B.E., I.A., *President.*
Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E.†
Mr J. H. Ritchie, M.A., B.Sc., I.A.S.†
Mr. C. U. Wills (1st Meeting).‡
Rai Bahadur S. M. Bapna, C.I.E. (2nd Meeting).‡
Mr. C. R. Palairet, M.I.M.E., M.I.E.E. (3rd Meeting).‡
Rajkumar Sardar Singh.§
Mr. J. A. Merrett.§
Seth Kasturbhai Lalbhai (1st Meeting).†
Rao Bahadur Bhimbhai Ranchodji Naik (2nd Meeting).†
Sir Joseph A. Kay, Kt. (3rd Meeting).†
Mr. A. Howard, C.I.E., M.A., Secretary (1st and 2nd Meetings).
Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S., Secretary (3rd Meeting).

5. *Staff.*—Mr. G. C. Tambe, the Chief Farm Assistant, was deputed for one year from 5th May 1930 for extension work in Jhalawar State.

Mr. K. M. Simlote was confirmed, on finishing his probation, in the grade of Rs. 100-10-300.

A complete list of the staff is given in Appendix A.

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* See page 79 of this report.
† Representing the Indian Central Cotton Committee.
‡ Representing the Holkar State.
§ Representing Rutlam and Jaora States respectively.

6. *Research Students.*—Mr. G. G. Phadke, the holder of the Irwin Scholarship, which was founded by Sir Sarupchandji Hukamchand, Kt., the merchant prince of Indore, was deputed to Jaora State to look after the State Farm for a period of one year from the 6th April 1931.

Mr. Bholanath who was selected by the Indian Central Cotton Committee in December last to undergo training in cotton breeding work reported for duty on the 1st June 1931.

7. *Visitors.*—His Highness the Maharaja Vir Singh Dev, Orchha State, His Highness the Raja Rawat Sir Birendra Singh, K.C.I.E., Rajgarh State, Lord Clive, Count John De Salis and Sir M. V. Joshi, Sangli State, visited the Institute during the year.

8. *Library.*—The library was much strengthened during the year by the addition of a large number of books, periodicals, etc. 899 volumes consisting of 288 text books and works of reference, 409 volumes of journals and 202 reports and bulletins and also 1,595 reprints were added so that the library now contains 1,200 text books and works of reference, 2,000 volumes of periodicals, 700 foreign bulletins and reports, 1,500 copies of scientific publications, reports and bulletins of the Imperial and the Provincial Governments of India and 1,700 copies of reprints.

The number of periodicals increased from 81 to 100 and of them 30 were received on an exchange basis and 70 were purchased.

Owing to a growing demand for standard books on agriculture from visitors, the Contributing States and the interested public, a sales department was added to the library in 1928. Several hundred books in English, Hindi, Marathi and Urdu have since been purchased and sold. During the year under report 91 copies were purchased and 161 sold.

9. *Quinquennial report on the Institute.*—The quinquennial report for the five years ended October 24, 1929, which deals in detail with the purpose, conduct and progress of the Institute was published by the Oxford University Press under the title *The Application of Science to Crop Production, an experiment carried out at the Institute of Plant Industry, Indore.* Most of the edition has been sold and the royalties already received by the Institute more than cover the cost of production so that effective publicity for this item of the work of the Central Cotton Committee has been obtained at no cost to the Committee or to the Society. This book has been favourably reviewed in all the important journals in the Empire which deal with agricultural research. It has also been noticed in foreign countries, including the United States. The various notices, which include a leading article in the *Experiment Station Record*, the official organ of the United States Department of Agriculture, have been collected and printed copies have been sent to the members of the Central Cotton Committee and to the Darbars of the Contributing States.

10. *Equipment and lay-out of the Institute.*—The new sales-godown, for the storage and sale to cultivators of improved implements and appliances, has been completed, taken over and brought into use. The operations of the Trading Account are now separated from the working of the Institute proper, an arrangement which facilitates current work as well as such operations of stock-taking and audit.

The compost factory is now completely equipped and is in full working order. The present output is about 800 carts per annum, i.e., 40 carts per pair of oxen. It is capable of turning out 1,200 carts per annum, a figure which will be reached in about two years' time when the whole of the estate has been brought into proper cultivation. The maximum output is estimated at five carts per acre per annum, a very high figure for Indian conditions.

The blacksmith's shop is now provided with an electrically driven lathe and a drilling machine and has recently been put into thorough order and the current work speeded up. All ordinary repairs and construction can now be done on the spot. The carpenter's shop has also been put into good shape.

The electric installation has been completed at a cost of about Rs. 1,000. The permanent line is now extended to the cultivators' camp near Piplia Hana village so that in future the working of the cinema and the lighting of the camp will be simple matters. Mr. Palairet, Member for Commerce and Industry, Holkar State, and a member of this Committee, very kindly agreed to carry out the various extensions at cost price.

II. Research Work.

11. *Cotton.*—"The cotton work of the future must be a well-balanced combination of agronomy and genetics with soil science."—*The Application of Science to Crop Production Bombay*, 1929.

(*a*) *The growing of cotton.*—In the last annual report great stress was laid on the agronomy of cotton and it was stated, "Everything points to the conclusion that the actual growing of cotton is of the greatest importance. An increasing amount of attention should therefore be paid to this matter during the next 20 years. Compared with the results which follow better farming, *the improvement of the variety by itself is a comparatively minor matter*. It is therefore not much use trying to improve the variety alone. The work of the plant-breeder should go hand in hand with improved agronomy and then and then only can the great potentialities of the cotton areas of India be realized." The results of 1930 after an exceptionally wet year—the rainfall in 1930 was 40 inches—confirm the above quotation from last year's report. The following tables show the combined effects of proper grading, surface drainage, and clean cultivation together with normal application of compost against local methods of cultivation which do not give more than 250 to 275 lbs. of seed cotton per acre on the average even in normal seasons.

Table 1—*Yields in well-laid plots.*

Year.	Area in acres.	Average yield in lbs. per acre.	Highest yield outturn per acre.	Rainfall in inches.
1928 ..	6.64	510	515	40.95
1929 ..	36.98	578	752	23.11
1930 ..	27.75	656	1,013	44.94

Table 2—*Yield in plots that still require a little more levelling and grading.*

Year.	Area in acres.	Average yield in lbs. per acre.	Rainfall in inches.
1928	66.90	394	40.95
1929	93.60	446	23.11
1930	98.14	443	44.94

Better methods of cotton growing are needed in India far more than better varieties. The best results, however, can only be obtained by a combination of better farming plus better varieties. Further, when cotton is properly grown on the black soils it is remarkably free from insect and fungoid pests while such troubles as boll-shedding and *wilt* are almost curiosities. The successful treatment of the many diseases of cotton appears to lie in the direction of improved agriculture rather than by applying the conventional methods of entomology and mycology. It is however not suggested for one moment that the Central Cotton Committee should revise its research programme on the diseases of cotton. This work should continue as at present planned but, side by side, work on the lines now in

progress at Indore should also be encouraged. In the course of a few years the future policy of the Committee in these matters will need no discussion. It will be based on the one unanswerable argument—" Success."

(*b*) *The development of soil colloids during the rains.*—The work on this important subject is rapidly developing. The connection between this factor and " Red Leaf " has been definitely proved. There is also a growing body of evidence that the real cause of cotton *wilt* will be found in reduced permeability, followed by poor aeration and the water-logging of the pore-spaces. The *fungi* which are associated with *wilt* appear to be consequence rather than causes of this trouble. These observations open upon a new and promising line of approach for dealing with cotton *wilt* on the black soils.

The existence of a colloidal factor in checking growth for very long periods after heavy rain, which has for some time been suspected, was definitely proved during the year. This occurs as a thick subterranean pan several inches in thickness between the surface soil and the *murum*. These pans act like rubber ground sheets and by greatly hampering percolation lead to the stoppage of growth for long periods. Considerable progress has been made in the systematic mapping of these pans wherever they occur. It will be interesting to see the combined effect of the new methods of agriculture, grading, surface drainage, the use of compost and the inclusion of deep-rooted crops like *tur* (*Cajanus indicus*) in the rotation as well as continuous dressing of small quantities of sulphur applied just before the rains on these pans. It is more than probable that these layers are the consequence of bad farming in the past and that they will gradually disappear as time goes on.

(*c*) *The improvement of the variety.*—During the present year an early maturing type of American cotton, Indore No. 1, obtained by selection from the mixed *Cambodia* crop now being grown in the Rutlam State, has been tried at Basi in Jaipur under well irrigation. The results are so promising that steps are being taken to work up a supply of seed for distribution in the neighbourhood. Arrangements have also been made for the trial of Indore No. 1 at Ganganagar on the Gang Canal in the Bikaner State.

Another interesting result has been obtained at Basi. The mass-selected *Malvi* grown at the Institute has been tried as a rains crop. Although the total rainfall of 1930 was only 15 inches, nevertheless a fair crop has been obtained and there seems no doubt that a deep-rooted type of this character can be grown with success in Rajputana without irrigation. This will be a new money crop for this area as cotton is now only grown under irrigation.

Malvi cotton.—Of the 14 pure line selections that were examined during the year, 4 were discarded as they fell below the standard. Of the remaining 10 selections, 4 are more promising than the rest but all the 10 selections will be grown and selfed as usual in the coming year and also their seed will be multiplied for comparative tests for yield of cotton.

The four promising selections have staple 23-24 m.m. long and 28.5-30 ginning percentage. Their lint is soft to the touch and fairly bright.

Bani cotton.—Of the six selections that were tried during the year two were discarded as unsuitable. Of the remaining, one is decidedly superior to the rest, having 24.8 m.m. of staple length and 29 ginning percentage but the other four selections will be continued and their seed multiplied for trials of yield in the next year.

Roseum cotton.—The four selections of the previous year were grown again this year. Their staple length varies from 19 to 20 m.m. and their ginning percentage from 36 to 37.5. These selections will be distributed to the cultivator in place of local *Roseum* only in case any other better variety fails to take its place.

Cawnpore (*local*) *cotton.*—The three selections of the last year were repeated again this year. They are short-stapled (18 to 20 m.m.) and high ginning (42 to 44.8 per cent.) types and might prove useful for crossing with low ginning but long-stapled varieties.

Verum cotton.—Selection work on this cotton was started this year.

Irrigated cottons.—Twelve selections of *Cambodia* cotton, including No. 440 and No. 664 of Coimbatore types, were tested during the year. The two Coimbatore types and one Indore selection appear promising as far as yield and quality of cotton are concerned but the first two are liable to damage by frost as they are late maturing types.

(*d*) *Fundamental investigations on cotton.*—One of the main purposes of the Indore Institute is the conduct of investigations of a fundamental character which bear on the general cotton problems of India. Although these investigations are naturally not complete a good deal of progress has been made and a number of important results have already been obtained.

(*e*) *The validity of the method of pure line selection in cotton.*—A matter of the first importance in the improvement of cotton is to determine whether the well-known advantages of pure line selection are greater than the disadvantages which are likely to follow continued self-fertilization. An answer to this important question is beginning to be obtained. For six consecutive years the selected progeny raised from individual selections from the *Malvi* crop in 1924 have been under close observation in order to determine whether any falling off in general vigour, as compared with the mass selected *Malvi* crop, could be detected. In 1929 the first signs of this were detected. In 1930, steps were taken to include large-scale cultures of the ordinary crop between similar plots of pure lines raised from self-fertilized seed for the last six years. A distinct falling off in vegetative vigour on the part of the pure lines was observed which indicate very clearly that continued self-fertilization in cotton cannot possibly in the long run be successful. It will of course be necessary to follow up the observations of 1930 by a careful set of measurements and it is most desirable that these pure lines of *Malvi* should be continued for at least another four or five years or even longer. The results already obtained, however, suggest that in place of the pure line, the improved cottons of the future should be a mixture of pure lines which allow of sufficient crossing to keep up the vegetative vigour without producing an undue range in the quality of the fibre. An experiment on these lines has been arranged to determine among other things, (1) what range in the length and other qualities of the fibre follows the mixing of six pure lines, (2) how does such a mixture compare in vigour with the ordinary mass-selected crop and with the individual pure lines from which the mixture was orginally made. On the results of these experiments, which might be duplicated at other places in India, the future policy of cotton mprovement will have to be based.

(*f*) *The experimental error in variety trials.*—One of the great difficulties in agricultural work at the present time is to obtain accurate yields which are really significant. The conventional method of dealing with this difficulty is to subject the figures to mathematical treatment. A better method would be to reduce the experimental error to negligible proportions and so avoid the use of formulæ altogether. A solution of the general problem on these lines is already in sight at Indore. The chief cause of uneven growth on the black soils is undoubtedly poor surface drainage. Once the surface is graded so that the work of removing the excess rainfall is done uniformly on the whole area and the surplus water runs off in a thin sheet without carrying any of the soil with it, a remarkable change in the growth occurs. Fields which were originally patchy now give uniform crops. When this improvement is followed up by proper cultivation, by suitable manuring and by a good crop rotation, rapid progress towards absolute uniformity takes place. On a number of plots accurate records dealing with this question are being kept. In a very few years it is certain that the Institute will possess large areas of even land on which variety trials and other field experiments can be relied on to yield significant figures which will need little or no mathematical treatment. The solution of this question appears to lie in better farming and not in attempting to cover up the results of poor agriculture by a mass of figures. In this way it is more than probable that a large portion of the literature on the subject can soon be put on the scrap heap and relegated to the lumber-room of exploded ideas.

(*g*) *The root-development of cotton.*—Of recent years a great deal of attention has, been paid to root development including the root-development of cotton. At Indore, this matter has been under investigation for five years and it is now possible to sum up the general results obtained. The ordinary root exposures of cotton, although of some interest, are by themselves of little real value. What is wanted is a method which deals effectively with the relations between the root-system and the soil type as well as with the amount of growth and the yield of cotton. Once the general facts relating to the root-development of any variety are known, the next step is to correlate root-development with growth throughout the whole growing period and to include in this study the main facts relating to the soil type as well as the influence of the rainfall on permeability. When all these factors are considered together, a very good idea of the suitability of any cotton for black soil conditions can be obtained. The great danger of this work is fragmentation. The plant and the soil must be considered together as parts of one system. The effect of the rainfall on permeability throughout the season is another consideration. The results so far obtained show that the most important character of the root-system of any successful variety on the black soils is its ability to obtain the necessary amount of moisture from the sub-soil during the ripening process. In this respect Indian cottons are distinctly superior to American types. A fine looking field of cotton is useless unless the bolls open rapidly and well. A good finish is everything in a rains-fed cotton crop.

(*h*) *The manuring of cotton.*—Perhaps the most fundamental problem in the improvement of cotton on the black soils of India is the question of manure and the best method of utilizing the leguminous crop (including green manuring crops) in the cotton rotation. A practicable solution of this important problem has been found at the Institute. The results have already been reported to the members of this Committee. Moreover, the work is already being taken up in the Contributing States and is certain, in the course of time, to spread to British India.

12. *Groundnut.*—Spanish Peanut was introduced in 1926 at the Institute as a rotation crop with cotton and it has now spread to many of the Contributing States. A new variety, Akola No. 10, was tried this year side by side with the Spanish variety and the result is, as seen in the table below, encouraging.

TABLE III.

Variety.	Yield in maunds per acre.
Spanish Peanut	8-34-0
Akola No. 10	11-30-0

The new variety has big nuts, is easy to harvest, and in addition seems to have the capacity for high yield. It will be tried one more year before it is introduced in the Contributing States.

13. *Wheat.*—Malvi wheat was compared again with Pusa No. 100 and C.P. No. 115 without irrigation. The results were as follows :—

TABLE IV.

Variety	Yield in maunds per acre in field No. 1.	Yield in maunds per acre in field No. 6.
Malvi	6.9	5.0
Pusa 100	9.9	4.5
C. P. 115	6.3	3.7

The Pusa and the C. P. varieties are less susceptible to rust and ripen earlier than the local variety but fetch less price in the local market.

Pusa 4 variety was tried under irrigation and it gave 20.0 maunds of wheat per acre.

Seed of these pure varieties was distributed in small quantities in a number of the States.

14. *Sugarcane.*—S. 48 was introduced in 1926 from Shahjahanpur and it has now spread to all Contributing States. It gives 20 per cent. more yield of jaggery (Gur) of superior quality which fetches a higher price per maund. Coimbatore 281 and 290 were also tried in 1929-30 and although the results were inferior to those of S. 48, they are not regarded as conclusive and the trials continue.

15. *The fodder supply of the black soil areas.*—One unexpected result, bearing on the fodder supply of the black soils, and one of indirect interest to cotton growers has been obtained. This related to the growth of grass in the rains and to the supply of dry grass for the rest of the year. At first, large sums of money had to be spent by the Institute on the purchase of dry grass for the work cattle. Since 1929, the Institute has been self-supporting in this respect and there is now a large excess which has enabled a substantial fodder reserve to be built up. In future years, it will be possible to sell grass. This result is due to the improved surface drainage of the leased area. The surface drains in the grass strips round the fields have led to greatly increased growth of grass. The grading of one of the grass areas, to allow of easy surface drainage, has markedly improved not only the yield but also the quality of the grass. The results of this grading are set out in Table V.

TABLE V—*The effect of grading on the growth of grass at Indore.*

Nature of surface.	Yield per acre of dry grass in maunds.	
	1929.	1930.
Graded	93.25	55.60
Non-graded	35.50	10.60

The great difference in yield per acre between 1929 and 1930 is due to the rainfall. In 1929 the rainfall was 23.4 inches, in 1930 it was 45 inches. Excessive rain on the black soils always reduces the grass yields.

16. AGRONOMY.

(*a*) **Compost manure and green manuring.—The preparation and application of manure.*—At two meetings of the Indian Central Cotton Committee, samples of compost, prepared from cotton stalks by the Indore method, were exhibited. This material, made from the mixed vegetable wastes of the Institute area, supplemented by such refractory materials as waste paper, wood shavings and saw-dust, is at least two and a half times as valuable as ordinary farmyard manure. It is proving an excellent manure for cotton when applied at the rate of 10 carts per acre to the preceding leguminous crop—groundnuts, *san* hemp or gram.

The manufacture of compost has now been standardized both during the rains and during the rest of the year. A full set of working directions has been drawn up and the

* "The Waste Products of Agriculture, their Utilization as Humus," A. Howard, C.I.E., M.A. (Oxford University Press, Rs. 5), gives a description of the process in simple terms and an account of the experimental work leading up to it.

method is already being taken up in the Contributing States. Very good samples of finished compost from a number of centres, including Bundi in Rajputana, are now finding their way to the Institute. The amount of water needed in the process is much less than was expected, namely, 200 gallons per cart load of finished material.

In the course of this work two important problems have been solved :—

(1) It has been proved that only a small proportion, about one-third of the cattle dung s really essential for the composting process. The rest can either be used for fuel or else added to the compost mixture. In the first case, when the minimum amount of cattle dung is used, fixation of nitrogen from the air takes place and there is a gain in nitrogen. In the second case, as would be expected, a certain amount of loss of nitrogen occurs.

(2) The best method of green manuring in India is not to plough in the whole of the green crop during the rains as is now the practice but to divide it equally between the soil and the compost factory. The below-ground portions are added to the soil: the above-ground portions should be reaped, withered and used for the manufacture of compost. In this way both the land under the green manure and the compost factory benefit.

These results are of incalculable value to the cotton growers of India and indeed to the whole country. They prove, (1) that the manurial problem of India can be solved by any industrious cultivator, (2) that the burning of cow-dung for fuel by the people need not be interfered with—a consideration of the greatest importance in introducing the new compost process in the villages, (3) that greatly increased yields of cotton and other produce are now well within the reach of the villages provided all vegetable wastes are properly utilized.

The Institute has reason to be proud of this achievement in the way of finding out a simple but very effective method of converting all waste matter on the farm into valuable compost, the nitrogen content of which is as high as 0.8 to 1.2 per cent. The process itself is very simple and can be carried on throughout the year. It requires no purchased substance such as Adco, and every material necessary is available on the farm itself. The time taken from start to finish is also not more than three months under normal conditions and even hard materials like cotton and *Tur* stalks can be converted into fine compost in this period. The whole process and the materials necessary are well within the means of an ordinary cultivator.

Compost making is now in full swing and special attention is being paid to training of labourers. Four trained hands have already been sent out for extension work and they are all working independently in different parts under the directions of the Chief Chemical Assistant.

(*b*) *The Indore Ridger.*—This new implement for the interculture of cotton and other crops has been placed on the market and is proving very popular with the cultivators, 529 having been sold during the year.

During 1930, the following results were obtained at Indore :—

Crop.	Yield per acre in maunds.		Difference in favour of ridger in maunds per acre.
	Ridged.	Flat.	
Cotton	5.8	5.3	0.5 (9.4 %)
Groundnut	9.9	7.7	2.2 (28.5 %)
Juar for silage	128.6	105.6	23.0
Wheat Pusa	22.5	19.0	3.5
Malvi	7.5	6.3	1.2

17. PROPAGANDA.

Contact with the cotton grower.—The results obtained at an experiment station are of little value to the country-side unless effective means are taken to get them firmly welded into the rural economy. The first step is to bring the results and the cultivator together. The second step is to decide whether to undertake an extensive campaign dealing with the whole country-side or to begin extensively on small selected areas. The policy adopted at Indore is to make as much use as possible of the Institute itself in showing the cultivator what can be accomplished. After this, the best policy (with the means at our disposal) is to work intensively on selected areas, in other words, to concentrate rather than diffuse the work in the districts. Once the cultivator is interested and the lessons of the experiment station have been applied to, say, a group of 50 to 100 villages in any of the Contributing States, the rapid spread of the work is certain. Little impression, however, can be made and no effective supervision and control are possible, if the effort is spread over too large an area.

In the autumn of 1930 a very useful and a very practical suggestion for bringing the cultivator and the Institute together was made by Mr. W. T. Aldous of the Publicity Branch of the Railway Board. Mr. Aldous suggested that the idea of the annual cultivators' meeting should be developed and that there should be a permanent cultivators' camp for 50 *kisans* alongside the Institute and that the railways should arrange for the following assistance: (1) through carriages for parties of cultivators on the narrow-gauge railway to Indore, (2) concession rates for such parties, and (3) that the railways should help in bringing the work of the Institute to the notice of the cultivators. There is an excellent camping ground alongside the Institute already provided with trees and a well. At a small cost it has been connected with the existing road system. All that is needed is to erect the quarters including two shops for the *kisans*, together with the necessary conservancy arrangements. A careful estimate of cost has been made. It will not exceed Rs. 30,000. The Holkar State, as already mentioned in this report, has made over to this Institute the necessary land on the same terms as the rest of the Institute area. The railways have already taken effective steps in helping in publicity. In addition to Mr. Aldous, two Indian Railway Publicity Officers visited the Institute. The railway authorities have purchased a large quantity of literature and they have printed and distributed free of charge 4,000 Hindi copies of the notes relating to the last cultivators' meeting. The only obstacle to the development of the scheme is that the present does not seem a very propitious time to appeal for funds for building the quarters nor are some of the States now disposed to spend money even on concession fares for cultivators who, as a class, are nowadays unable to pay for their own transport.

A good deal of propaganda or perhaps what is better termed extension work was carried on among the Contributing States in various ways. Their officers were received for training over periods of 3 to 9 months, a course of classes was arranged especially for Revenue officials, visits were made to the States by the Director or members of the staff, and from time to time leaflets have been issued.

This consistent maintenance of close relations with the Contributing States and their cultivators is building up an atmosphere of confidence and is giving the Institute a prestige and authority which will be invaluable when the time comes for inaugurating a general scheme for the distribution of pure selected cotton seed to replace the mixed *Malvi* cotton grown in black soil States as well as the poor types common in other areas.

APPENDIX A.

List of Members of the Staff.

Director	A. Howard, Esq., C.I.E., M.A. (retired)
Officiating Director	P. H. Rama Reddi, M.A., B.Sc., I.A.S.
Personal Asst. to the Director ..	Mr. M. L. Saksena, L.Ag., F.I.S.C.
Assistant I/c Farm	,, G. C. Tambe, B.Ag.
Chief Chemical Assistant ..	,, Y. D. Wad, M.A., M.Sc.
Chief Botanical Assistant ..	Vacant.
Botanical Assistant	Mr. R. L. M. Ghose, M.Sc.
Plant-breeding Assistant ..	,, Kuber Singh, B.Ac.
Farm Assistant No. 1	,, S. C. Talesra, B.Ag.
Farm Assistant No. 2	,, K. M. Simlote, B.Ag.
Head Clerk and Accountant ..	,, M. A. Shakoor, B.Com., F.I.C.A.
Second Clerk	,, Har Prasad Saksena.
Librarian	,, Bashirhusain Khan.
Artist	,, S. R. Srinivasam Ayyar.
Storekeeper	,, Isri Prasad.
Fieldman No. 1	,, Nihal Singh.
,, *No.* 2	,, V. R. Sathe.
,, *No.* 3	,, E. L. Rajanna.
Mistri	Temporary occupant.

APPENDIX B.

INSTITUTE OF PLANT INDUSTRY, INDORE.

CURRENT ACCOUNT.

Dr. — *Cash Receipts and Payments for the year ended 31st March, 1931.* — *Cr.*

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
To Opening Balance		16,061 13 10	By Director's pay, leave salary, house allowance and Provident Fund ..	43,883 2 0	
„ *Contributions*—			„ Leave and Pension contribution—Officers	1,755 10 0	
From Indian Central Cotton Committee	1,15,000 0 0		„ Salaries of staff	33,745 11 9	
From Central India and Rajputana States	20,600 0 0		„ Leave and Pension contribution—Staff	520 7 0	
		1,35,600 0 0	„ Provident Fund of staff	3,800 1 9	
			„ Medical charges	502 0 0	
„ *Donations*—			„ Travelling expenses	4,424 11 0	
			„ Rent of land	300 0 0	
From Jaora Durbar for construction of a block of quarters		2,400 0 0	„ Fire Insurance and Protection	483 12 0	
			„ Audit fee	500 0 0	
				Rs. a. p.	
			„ Farm working expenses	25,419 7 11	
			„ Building materials, implements, water, cart, fencing, pump, etc.	3,426 8 3	
					28,846 0 2
„ *Sales*—			„ *Purchase and upkeep of machinery*—		
			Machinery	1,204 9 0	
Farm produce	5,729 5 0		Maintenance	326 12 9	
Miscellaneous receipts ..	3,794 7 2				1,531 5 9
		9,523 12 2	„ Laboratory apparatus and chemicals		3,938 8 2
			„ Books and Periodicals		4,361 10 6
„ *Deputation Account*—					
			„ Miscellaneous Expenses	2,541 12 10	
Refund of unspent balance ..		3,591 2 11	„ Furniture, fittings and other equipments	1,615 2 0	
					4,156 14 10
„ *Director's Leave Pay Account*—			„ Publications		1,932 9 0
			„ Unforeseen and Demonstration expenses		1,715 11 7
Refund of unspent balance ..		1,779 6 3			1,36,448 3 6
			„ *Non-recurring expenses*—		
			Lord Irwin Scholarship		1,800 0 0
			Construction of a Sales Godown		8,628 10 2
			Deputation Account		2,500 0 0
			„ *Cash*—		
			Cash in hand	318 5 6	
			With Imperial Bank of India, Indore, including balance of Lord Irwin Scholarship Account (Rs. 1,523-8-9)	19,261 0 0	
					19,579 5 6
Total ..	....	1,68,956 3 2	Total ..	....	1,68,956 3 2

Report of the Auditors.—We have examined the above statement of accounts of the Institute of Plant Industry, Indore, with the books and vouchers for the year ended 31st March 1931, and have obtained all the information and explanations we have required, and in our opinion the same is properly drawn up so as to exhibit a true and correct view of the financial affairs of the Institute for the year as per the explanations given to us and as shown by the books of the Institute.

BOMBAY, 1st *April* 1931.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors

INSTITUTE OF PLANT INDUSTRY, INDORE.

TRADING ACCOUNT.

Balance Sheet as at 31st March 1931.

LIABILITIES.	Rs. a. p.	Rs. a. p.	ASSETS.	Rs. a. p.	Rs. a. p.
Capital—			*Book Debts—*		
Advance from Current Account as per last Balance Sheet ..		10,000 0 0	Holkar State—Wheat Account	125 6 3	
			Bikaner State	4 12 0	
Sundry Creditors—			Jaora State	87 4 0	
Holkar State—Balda Farm ..	549 0 0		Bharatpur State	25 6 0	
Rewa State	595 7 6		Dhar State	3 7 0	
Narsingarh State	4 8 0				246 3 3
Students' Deposits	15 0 0		*Sundry Debtors—*		
		1,163 15 6	Bills outstanding		1,986 14 3
Ganganagar Scheme—			*Stock-in-trade—*		
Balance as per account ..		12,478 8 9	Certified by the Director, at cost—		
Profit and Loss Account—			Publications	1,075 8 4	
Balance as per last Balance Sheet	1,400 9 0		Implements	6,095 3 5	
Less—Loss as per account (subject to proportionate establishment and other charges)	313 9 1				7,170 11 9
		1,086 15 11	*Cash at Bank*		15,325 10 11
Total ..	....	24,729 8 2	Total ..	....	24,729 8 2

We have examined the "Trading Account" Balance Sheet of the Institute of Plant Industry, Indore, as at 31st March 1931, and have obtained all the information and explanations we have required.

In our opinion, such Balance Sheet is properly drawn up and exhibits a true and correct view of the state of the Institute's affairs according to the best of our information and explanations given to us and as shown by the books of the Institute.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

BOMBAY, *1st April* 1931.

APPENDIX III.

BOMBAY GOVERNMENT, REVENUE DEPARTMENT.

BOMBAY CASTLE, 11*th May* 1931.

No. 535-*A*.—Whereas it is necessary for the purpose of maintaining the quality and reputation of the cotton grown in the areas in the Bombay Presidency mentioned in Schedule I hereto appended.

Now, therefore, in exercise of the powers conferred by sub-section (1) of section 3 of the Cotton Transport Act, 1923 (III of 1923), the Government of Bombay is hereby pleased to prohibit the import of cotton into the said areas by rail, road, river and sea or by any one or more of such routes save under and in accordance with the conditions of a licence prescribed in this behalf.

(2) The Government of Bombay is further pleased to prohibit, under sub-section (2) of section 3 of the said Act, the delivery to, and the taking of delivery by, any person, at any of the railway stations specified in Schedule II hereto appended of any cotton when such cotton has been consigned from a railway station not situated in the said areas unless such person holds the prescribed licence for the import by rail of cotton into the said areas :—

SCHEDULE I.

PROTECTED AREA.

Nerbudda-Mahi Zone consisting of that portion of the Bombay Presidency which lies between the Nerbudda and Mahi rivers within the following boundaries :—

On the North.—The Mahi river or the north boundary of the Rewa Kantha Agency whichever is farther north.

On the South.—The Nerbudda river or the north boundary of the Rajpipla State whichever is farther north.

On the West.—The sea.

On the East.—The eastern boundary of the Rewa Kantha Agency or the eastern boundary of the Panch Mahals whichever is farther east.

SCHEDULE II.

The railway stations included in the protected area are as noted below :—

BROACH-JAMBUSAR RAILWAY.

Broach.	Tralsamadh.	Samni.	Amod.
Vijalpore.	Dayadra.	Tancha.	Jambusar.

BOMBAY-VIRAMGAON LINE.

Broach.	Nabipur.	Palej.
Chavaj.	Varedia.	

JAMBUSAR-DABHOI.

GAIKWAR'S BARODA STATE RAILWAY.

Jambusar Junction.	Jambusar Road.	Ankhi.

ANAND-GODHRA SECTION.

Timba Road.	Tuwa.	Godhra.

GODHRA-LUNAWADA.

Godhra.	Khandia.	Shehera.

BOMBAY-DELHI SECTION.

Godhra.	Sant Road.	Dohad.	Derol.
Kansudi.	Jekot.	Bordi.	Kharsalia.
Chanchelao.	Rentia.	Anas.	

CHAMPANER-PANI MINES BRANCH.

Kanjarai.	Halol.	Pavagarh.	Shivrajpur.

By order of the Government of Bombay (Transferred Departments),

R. D. BELL,
Chief Secretary to Government.

APPENDIX IV.

COMMERCE AND INDUSTRY DEPARTMENT, HOLKAR STATE.

NOTIFICATION.

Notification No. 2194, *dated the* 20*th May* 1931.

WHEREAS it is necessary for the purpose of maintaining the quality and reputation of the cotton grown in the Holkar State,

Now, therefore, in exercise of the powers conferred by sub-section (1) of section 3 of the Indore Cotton Transport Act, 1930, the Government of His Highness is hereby pleased to prohibit the import of cotton into the State save under and in accordance with the conditions of a license prescribed in this behalf.

(2) The Government of His Highness is further pleased to prohibit the import of cotton by any person unless such person holds the prescribed license for the import of such cotton into the State.

In exercise of the powers conferred by Section 5 of the Indore Cotton Transport Act (Act No. II of 1930) the Government of His Highness the Maharaja Holkar is pleased to make the following rules to carry out the purposes of the said Act, namely :—

1. *Licensing Authority : Form of application for a license.*—Licenses for the import of cotton into the protected area will be granted by the Director of Industries and Commerce, Holkar State, and application should be made to that Officer in Form A* annexed to these Rules.

* Not printed,

2. No cotton of which the import has been prohibited by or under Section 3 of the Cotton Transport Act, 1930, shall be imported into any protected area by road or rail save under and in accordance with the conditions of a license issued as provided by these Rules.

3. *License for import of cotton for manufacture* :—

(1) Annual licenses for import by rail shall be granted to manufacturing concerns situated within the protected area for the importation of cotton or of any specified kind of cotton from outside such area for manufacture only. Such licenses shall be in Form B* hereto annexed and shall be subject to the conditions stated therein.

(2) A certified copy of such licenses shall be delivered in Form C* hereto annexed at the *Naka* or other place specified by the Licensing Authority to the Officer mentioned in the license who shall forward it to the Licensing Authority.

(3) The license shall be returned to the Licensing Authority at the expiration of the period for which it is granted together with all unused certified copies of the same.

4. *License for particular consignment by rail* :—

(1) A single license to cover only one consignment may be granted to such persons as can satisfy the Licensing Authority that it is necessary to import cotton or any specified kind of cotton (i.e., cotton-seed or unginned cotton) into the protected area. Such licenses shall be in Form D* hereto annexed and shall be subject to the conditions stated therein.

(2) Such licenses shall be delivered at the *Naka* or other place specified by the Licensing Authority to the Officer mentioned in the license who shall forward it to the Licensing Authority.

5. *License for particular consignment by road* :—

(1) A single license to cover only one consignment may be granted to such persons as can satisfy the Licensing Authority that it is necessary to import cotton (i.e., cotton-seed or unginned cotton) by road into the protected area. Such licenses shall be given in Form E* annexed and shall be subject to the conditions stated therein.

(2) Such licenses shall be delivered at the *Naka* or other place specified by the Licensing Authority to the Officer mentioned in the license who shall forward it to the Licensing Authority.

6. *Separate license to be issued for different kinds of cotton.*—Separate licenses will be ssued for different kinds of cotton, that is to say, for cotton-seed or unginned cotton (*kapas*).

7. *Fees to be paid to the Licensing Authority.*—There shall be paid to the Licensing Authority in respect of the matters mentioned in Schedule I, the fees therein specified.

8. *Penalty.*—Any contravention of these Rules or of the conditions of any license, not otherwise punishable under the said Act, shall be punishable on conviction by a Magistrate with fine which may extend to two hundred rupees.

S. SUDAGOPAN,
Secretary,
Commerce and Industry Department.

C. R. PALAIRET,
Member for
Industries and Commerce, Indore.

* Not printed.

APPENDIX V.

MADRAS COTTON CONTROL BILL.

A Bill to provide for the prohibition of the cultivation and possession of certain kinds of cotton, the mixing of such cotton with other cotton, the trade in such cotton and the restriction of the use of such cotton.

WHEREAS it is expedient in the best interests of the growers of cotton in certain areas in the Presidency of Madras, the cotton trade and the economic prosperity of the said Presidency, to maintain the quality and reputation of the cotton grown in those areas and for that purpose to prohibit therein, the cultivation and possession of certain kinds of cotton, the mixing of such kinds of cotton with other cotton and the trade in such kinds of cotton and to restrict the use thereof;

AND WHEREAS the previous sanction of the Governor General has been obtained to the passing of this Act.

It is hereby enacted as follows :—

Short title and extent.

1. (1) This Act may be called the Madras Cotton Control Act, 193 .

(2) It extends to the whole of the Presidency of Madras.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context :—

(*a*) " cotton " means cotton plant, ginned and unginned cotton, cotton waste and cotton seed ;

(*b*) " notified area " means an area in which any kind of cotton is proscribed by a notification under section 3 ; and

(*c*) " proscribed cotton " means cotton proscribed by a notification under section 3.

Power of Local Government to issue notification proscribing specified cotton and prohibiting its cultivation, etc.

3. (1) If the Local Government are of opinion that the mixing of any kind of cotton with other cotton will be detrimental to the best interests of the growers of cotton, the cotton trade or the economic prosperity of the Presidency of Madras, they may by notification in the *Fort St. George Gazette*—

(*i*) declare such kind of cotton to be proscribed, and

(*ii*) prohibit

(*a*) the cultivation of such proscribed cotton, or

(*b*) the mixing of such proscribed cotton with any other kind of cotton, or

(*c*) the possession of such proscribed cotton or of any cotton which is mixed with such proscribed cotton, or

(*d*) the trade in such proscribed cotton, or

(*iii*) restrict the use of such proscribed cotton.

(2) Every notification under sub-section (1) shall define the local area within which and the period during which it shall be in force.

Penalties.

4. Whoever, in contravention of any notification under section 3—

(*a*) cultivates any proscribed cotton, or

(*b*) mixes any proscribed cotton with any other kind of cotton, or

(*c*) possesses any proscribed cotton or any cotton which is mixed with any proscribed cotton, or

(*d*) trades in any proscribed cotton, or

(*e*) uses any proscribed cotton,

shall be liable to a fine which may extend to fifty rupees and in default to simple imprisonment which may extend to one month and upon any subsequent conviction to a fine which may extend to five hundred rupees and in default to simple imprisonment which may extend to six months:

Provided that the keeping in a spinning mill of any proscribed cotton in the form of unginned cotton for the purpose of manufacture into yarn in that mill shall not be deemed to be an offence under this Act.

Power of entry and seizure.

5. (1) An officer authorized in this behalf by the Local Government may—

(*i*) between the hours of 6 a.m. and 6 p.m.

(*a*) enter upon any land in a notified area in which he knows or suspects that any proscribed cotton is being cultivated in contravention of a notification under section 3 and may uproot or cause to be uprooted any such cotton, and

(*b*) enter upon or into any land, building, vessel or place in a notified area in which he knows or suspects that any proscribed cotton or any cotton which is mixed with any proscribed cotton is kept in contravention of a notification under section 3;

(*ii*) in case of resistance to entry under clause (*i*), break open any door and remove any other obstacle to such entry; and

(*iii*) seize such uprooted cotton, proscribed cotton or cotton which is mixed with any proscribed cotton, as the case may be.

(2) Every officer seizing any cotton under this section shall forthwith:—

(*a*) make a report of such seizure to the Magistrate having jurisdiction to try the offences committed in respect of such cotton, together with a list of such cotton and furnish a copy of such list to the occupier of the land, building, vessel or place on or in which such seizure was made, and

(*b*) subject to such rules as the Local Government may prescribe, forward such cotton to the nearest officer authorized by the Local Government to receive it, for examination and report to the Director of Agriculture, Madras.

(3) The opinion of the authorized officer referred to in clause (*b*) of sub-section (2), contained in any document signed by such officer regarding the cotton sent to him for examination under that clause, may be used as evidence as to the nature of such cotton, in any inquiry, trial or proceeding under this Act.

Duty of owner and occupier to give facilities for inspection by authorised officer.

6. (1) Every owner or occupier of any land, building, vessel or place shall give all reasonable facilities to any officer authorised under sub-section (1) of section 5 to inspect such land, building, vessel or place.

(2) Whoever commits a breach of the provisions of sub-section (1) shall be punishable with fine which may extend to Rupees fifty.

Previous sanction and limitation for prosecution.

7. No prosecution for an offence made punishable by this Act shall be instituted :—

(*i*) without the previous sanction of the Director of Agriculture, Madras, or

(*ii*) after six months from the date of the commission of the offence.

Trial of offences.

8. No offence made punishable by this Act shall be inquired into or tried by a court inferior to that of a Presidency Magistrate or a Magistrate of the second class.

Indemnity.

9. No suit, prosecution or other legal proceeding whatsoever shall be entertained in any court against any person for anything in good faith done or intended to be done in pursuance or execution of this Act.

Power of Local Government to make rules.

10. (1) The Local Government may, by notification in the *Fort St. George Gazette* make rules consistent with this Act to carry into effect the purpose thereof.

(2) In making any rule, the Local Government may provide that a breach thereo shall be punishable with fine which may extend to fifty rupees.

APPENDIX VI.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton year: 1st September to 31st August.

(IN BALES OF 400 LBS. NETT.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503
Bombay Presidency	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623
Central Provinces and Berar	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736
Rest of British India	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101
Total—British India	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363
Total—Indian States	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996
Total—India	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(IN BALES OF 400 LBS. NETT.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
Hyderabad	15,210	16,697	19,067	20,823	23,074
Mysore	43,571	44,320	39,619	46,590	43,326
Baroda	46,070	46,884	48,852	59,043	62,578
Gwalior	24,257	25,716	36,708	41,463	45,207
Indore	53,526	65,391	76,070	83,026	88,620
Other Indian States	46,809	52,581	57,224	64,454	71,191
Total ..	229,443	251,589	277,540	315,399	333,996

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(IN BALES OF 400 LBS. NETT.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
Bombay	28,328	24,970	27,324	24,361	54,409
Madras	35,198	39,560	52,188	46,582	55,717
United Provinces	16,991	10,308	13,878	20,441	18,496
Central Provinces and Berar..	40,762	20,861	6,924	16,243	15,771
Punjab	3,910	4,739	3,760	4,361	4,307
Total ..	125,189	100,438	104,074	111,988	148,700

APPENDIX VII.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY—(1) *The Broach Tract.*—The policy of growing 1027-*A.L.F.* was continued and out of the total area of 5,50,000 acres of cotton in the tract, it is estimated that nearly 4,50,000 acres were under this cotton. The remaining area was under *Selection* 1-*A* type which is now spreading more and more as it has a higher ginning outturn and is reported to pay the grower better than 1027-*A.L.F.* During the year the Agricultural Department distributed about 2,53,000 lbs. of 1027-*A.L.F.* seed and opened depôts in 21 centres for the distribution of seed with the help of funds from the Indian Central Cotton Committee.

In certain villages on the southern bank of the river Narmada in Ankleshwar Taluka *Ghoghari* cotton is grown by some cultivators. A survey was made and it was found that it is grown in 12 villages covering an area of approximately 3,500 acres. The Agricultural Department opened seed depôts in suitable centres in this area and the people were persuaded to grow 1027-*A.L.F.* instead of *Ghoghari*. The co-operation of the local ginowners was sought and they have promised to pay less for this cotton next season, and notices have been distributed in the area warning the people not to grow *Ghoghari* cotton.

(2) *The Dholleras Tract.*—The improved variety of cotton now being introduced in this tract is *Wagad*-8. Due to an abnormal season—very wet July and cessation of rain in September—the progress was much retarded. *Wagad*-8 now covers 10 acres in the experimental stage of district trials and 70 acres as general sowing, but it is expected that next year it may extend to 200 acres.

(3) *The Kumpta-Dharwar Tract.*—The work of introducing two improved varieties of cotton, viz. *Jayawant* (*Dharwar No. I* x *Dharwar No. II*) and *Upland* (*Gadag No. I*) was carried out on an extensive scale through the Cotton Sale Societies at Hubli and Gadag with the aid of funds supplied by the Indian Central Cotton Committee. For multiplying pure pedigree seed of these two varieties blocks of Reserved Areas were organized as usual but on a larger scale with the intention of covering two lakhs acres with each variety. The Reserved Area under *Jayawant* cotton round Hubli was 17,057 and that of *Upland* 23,638 acres against 1,000 and 15,300 acres respectively last year. The cotton crop was far below average during the year and high yields could not be obtained. The quantities of seed cotton received from Hubli and Gadag Sale Societies from these Reserved Areas were 6,218 *dokras* (20,89,248 lbs.) *Jayawant* and 5,241 *dokras* (17,60,976 lbs.) *Gadag No. I* and the seed produced from them were 13,77,460 lbs., and 12,14,332 lbs., to cover 1,37,746 acres and 1,21,433 acres respectively during the coming season. With a view to spread *Jayawant* cotton all over the Kumpta-Dharwar area, separate seed-multiplication blocks of 525 acres at Haveri, 219 acres at Bailhongal and 302 acres at Athani were organized and the seed produced from these areas is sufficient to cover the Reserved Areas of 5,000, 2,000 and 3,000 acres respectively. It is intended to develop these three new centres with the help of the Indian Central Cotton Committee. No Reserved Areas were organized for multiplication of *Dharwar No. I* and *Dharwar No. I* x *Rosea* cottons which have proved very susceptible to wilt.

For the distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed depots were started as usual in different selected centres. The *dalals* of Gadag also stocked some pure seed for distribution. The total estimated area grown with pure seed was 50,000 acres under *Dharwar No. I*, 2,500 acres under *Dharwar No. I* x *Rosea* and 94,400 acres under *Gadag No. I* against 59,800, 3,800 and 1,24,000 acres respectively last year. The total estimated yields were 5,000, 430 and 10,500 bales against 10,000, 600 and 15,500 bales respectively last year. The fall in the Gadag area is due to unfavourable weather conditions. The popularity of this cotton, however, continues and is increasing. In the case of *Dharwar No. I* and *Dharwar No. I* x *Rosea* cottons, the fall was mainly due to the policy of substituting these by *Jayawant* cotton which is wilt-

resistant. The seed of *Jayawani* cotton stocked during the year is sufficient to cover an area of 1,37,746 acres during 1931-32 when there will be no *Dharwar No. I* and *Dharwar No. I* x *Rosea* cottons.

These improved cottons continued to be appreciated by the buyers who gave on an average Rs. 13 more per *naga* of seed cotton (1,344 lbs.) for *Jayawant* and *Dharwar No. I* cottons and Rs. 25 more for *Gadag No. I* in auction sales held at Hubli and Gadag respectively.

(4) *The Khandesh Tract.*—The cultivation of *Banilla* cotton has been continued in the areas selected for this purpose. It has spread naturally in almost all the *talukas* and the total area is estimated at a lakh and quarter acres producing 35,000 bales. Out of this nearly 10,000 acres were kept under control for purification purposes and nearly 3,500 bales of pure cotton were produced. The average yield for *Banilla* cotton over an area of 8,468 acres was 394 lbs. per acre, while the ginning percentage varied from 38 to 40 per cent. It fetched a premium of Rs. 13 to Rs. 26 per *candy* according to quality in the case of lint and Rs. 2 to Rs. 4 per *maund* of 168 lbs. in the case of *kapas*. The quality was unfortunately spoiled by rains. Buyers purchased it eagerly, nearly two-fifths being taken by the local mills.

MADRAS.—I.—*The Southerns Tract.*—(A) *Cambodia—Coimbatore.—General.*—The multiplication of the improved varieties of *Cambodia* cotton began in 1918-19. There are 15 Limited Liability Co-operative Seed Societies of cotton growers at present, against 12 in the previous year of which eight in the Avanashi Taluk with an area of 850 acres are under the control of the Co-operative Department while the rest are under the supervision of the Agricultural Department. Under annual contracts, the Agricultural Department has been supplying improved seed to selected cultivators and advancing Rs. 10 per acre towards cultivation expenses. The cultivators sow the seed supplied by the Department on "Seed Farms" and the operation is supervised by the Department. The lint from the seed farm *kapas* is sold by the Department in public auction on behalf of the *ryots* at a premium and the seed is bought by the Department at a premium of Rs. 2 per *pothi* of 250 lbs., and distributed among cultivators for extending the improved varieties. With the increased expansion of the seed farms, it is hoped that a greater quantity of good seed will be made available for cultivators and that eventually high-quality lint will become a common feature of the country.

(*i*) The number of seed societies for *Co.* 2 cotton under the control of the Agricultural Department at the Tiruppur Centre rose from 4 with an area of 447 acres in 1929-30 to 7 with an area of 718 acres in 1930-31. The Department also organized seed farms for 240 acres in the Annur area in the Avanashi Taluk. Thus the total area under seed farms was 958 acres against 612 acres in the previous year. The seed farms yielded on the average about 650 lbs. of *kapas* per acre for the first picking, i.e., 100 lbs. less than the normal, because the crops were sown late in October and suffered from excessive rain during the early stages of growth.

212,701 lbs. of improved seeds sufficient for sowing 10,500 acres were distributed in 1930-31 among the growers of cotton in the districts of Coimbatore and Salem for further production against 245,086 lbs. in the previous year. Of this 161,876 lbs. were distributed in the district of Coimbatore.

The acreage under improved seed from the seed farms managed by the Co-operative Department in Avanashi will be about 12,000 acres.

66,510 lbs. were transferred to other districts.

(*ii*) 225 *candies* of *Cambodia* lint were sold on behalf of the seed farm *ryots* at a premium of Rs. 20 to Rs. 30 per *candy* of 500 lbs. above the market rate against Rs. 12 to Rs. 15 in the previous year.

(iii) *Co-operative Ginning.*—A few *ryots* in the taluks of Pollachi and Gobichettipalayam ginned their *kapas* with Departmental assistance, sold the lint co-operatively. They also sold 164,000 lbs. of good seed for sowing in the district.

Cambodia.—Trichinopoly.—In the Trichinopoly District also *ryots* used 6,092 lbs. of *Cambodia* seed, made up of 3,092 lbs. supplied by the Department from Coimbatore and 3,000 lbs. distributed by a *ryot* in the taluk of Musiri. The seed was sown in about 600 acres against 4,870 acres in the previous year. The large fall in the area was partly due to the fall in the price of cotton and partly to the abnormal rains and floods during the sowing season.

Cambodia.—Madura.—The area under seed farms (*Co.* 2) was only 115 acres against 150 acres in the previous year. The crop suffered from drought during the later stages of growth and yielded therefore only 340 lbs. of *kapas* from the first picking as against 420 lbs. in the previous year.

44,845 lbs. of seed were distributed among the *ryots* as against 21,570 lbs. in the previous year. The total area under *Cambodia* (*Co.* 2) is estimated at 8,000 acres.

(B) *Karunganni—Coimbatore.—Karunganni* cotton is making headway in the dry lands of the district of Coimbatore and is displacing dry *Cambodia* and *Uppam*. This strain is being propagated also in seed-farm areas under contract with selected *ryots* as in the case of *Cambodia*. 99,875 lbs. of *Karunganni* seed mostly purchased from the seed farms of 1929-30 at a premium of Rs. 4 per *candy* of 500 lbs. were distributed among cultivators for sowing in the district of Coimbatore against 76,312 lbs. in the previous year. Only 520 lbs. were distributed in Salem. The area under the improved strains will be about 5,000 acres.

The area under seed farms grown by 24 *ryots* in 15 villages in the taluk of Udamalpet in 1930-31 amounted to 750 acres, i.e., nearly the same as in the previous year.

Karunganni.—South.—The multiplication of the seed *C.* 7 and *A.* 10 on seed farms and production and sale of lint to agencies like Seed Unions and Co-operative Societies were continued without the intervention of the Agricultural Department. The area under seed farms rose from 896 acres to 955 acres (557 acres under *A.* 10 and 398 acres under *C.* 7), in the year under review. An advance of Rs. 5 per acre was given as usual to the seed farm *ryots* for cultivation expenses. The average yield per acre was only 100 lbs. of *kapas* as against 196 lbs. in the previous year. The low yield was due to drought and attack of pests.

115,195 lbs. of seed obtained from the seed farms of 1929-30 were sold to *ryots* for sowing about 11,500 acres as against 110,012 lbs. in the previous year. The area under natural spread of the improved strains is about 61,500 acres. Departmental strains in varying degrees of purity are now universal throughout the South and pure *Uppam* seeds formerly sown in the Ramnad District are used only in mixtures with *Karunganni*.

II. *Northerns and Westerns Tract.—(a) Northerns.—N.* 14 is the important strain for the locality though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. It was grown on 1,728 acres in 13 villages in the taluks of Nandyal, Sirvel and Koilkuntla under seed farm conditions as against 1,649 acres in the previous year.

91,916 lbs. of *N.* 14 seed, mostly obtained from the seed farms of 1929-30, were distributed for sowing against 92,152 lbs. in the previous year. The total area cultivated from seed distributed by the Department and *ryots* was 29,489 acres, i.e., 2,216 acres more than the area brought under cultivation in the previous year. The estimated yield of *kapas* was only 98 lbs. per acre as against 190 lbs. in the previous year. The Department assisted the seed farm *ryots* and other cultivators who grew the strain in ginning their *kapas* and selling the lint jointly. 117 bales of lint were sold at a premium of Rs. 47½ per bale of 400 lbs., and 75 bales at a premium of Rs. 35.

(B) *Westerns.*—*H.* 1 strain evolved at the Hagari Experimental Station in the Bellary District is spreading not only in the Western Tract but also in parts of the taluks of Jammalamadugu and Proddatur in the Northern Tract. 258,091 lbs. of seed obtained from the seed farms of 1929-30 were distributed for sowing in seed farms and *ryots'* fields. The area so sown was about 22,500 acres as against 37,056 acres in the previous year. The area under seed farms in 6 villages around Guntakal and Adoni in 1930-31 was 6,407 acres as against 7,576 acres in the previous year, due to the fall in demand for departmental seed as the *ryots* reserved seed from their own crops. The estimated production of *kapas* ranged from 100 to 120 lbs. per acre as against 125 to 200 lbs. in the previous year. The low yield was due to drought. The Department assisted the *ryots* in ginning their *kapas* and selling the lint jointly. 800 bales of lint were sold at a premium of Rs. 14 to Rs. 25 per bale of 400 lbs.

UNITED PROVINCES.—*A.* 19.—The distribution of *A.* 19 cotton seed continues as usual and is rapidly expanding. This cotton is now a self-developing item and does not require special propaganda. The large number of indents received for seed not only from all parts of the United Provinces, but also from Central India, is a sufficient proof of its popularity. The demand from outside has by far exceeded the supply. The total quantity of seed distributed from the departmental and private stores amounted to 4,622 *maunds* and the estimated area under that variety is 86,430 acres.

C. 402.—Owing to the pressing demand of the local spinning and weaving mills for a long-stapled variety, a departmental production known as *C.*402 has come into prominence. It spins 17 to 22 counts, yields about 780 lbs. per acre and its ginning percentage is 35. The cotton was purchased by the Department from the cultivators to whom seed had been supplied. They were given premia ranging from Rs. 1-8-0 to Rs. 2 per standard *maund* of seed cotton (*kapas*). After ginning and baling, the lint was purchased by the Cawnpore and Hathras Mills at Rs. 10 per *candy* over the Broach rate at Bombay. The total amount spent on cotton purchase during the last two years by Government was Rs. 48,434, and after paying interest amounting to Rs. 484-4-4 a net profit of Rs. 9,282-6-9 was credited to Government.

C. 520.—Another departmental variety known as *C.* 520 spinning about 12s is being introduced in localities where irrigation is defective. The estimated area under this strain is about 400 acres this year. It is likely to prove a good cotton where quantity is the sole attraction.

C. 1031.—Seed of 1031 was also distributed in districts where cultivators prefer it to other varieties. The cotton has proved very attractive to the growers in new areas.

THE PUNJAB.—The total area under American cotton was reported in the final cotton forecast to be 836,100 acres as compared with 825,100 acres in the preceding year. Of this area 4 *F.* was grown on 753,802 acres.

285 *F.*—a later selection—was reported to have been grown on 1,387 acres, whilst 289 *F.*—the other later selection—was reported to have been grown on 34,207 acres. The area under 289 *F.* is increasing every year.

In the final cotton forecast an area of 1,329,200 acres was reported under *Desi* cottons against 1,343,900 acres during the preceding year. *Mollisoni*—a selection of the *Indicum* variety—was grown on 388,538 acres whilst a type of improved *Roseum* was grown on 88,546 acres.

At Lyallpur and Hansi work continued on the selection of types of both American and *Desi* cottons with a view to produce improved strains.

Work also continued on the collection of developmental and meteorological data at Lyallpur.

CENTRAL PROVINCES AND BERAR.—Another big advance was made during the year by the isolation and development of two new high-yielding and wilt-resistant strains of *Verum*, viz., " Early " and " Late." The latter possesses a staple of 1" and is suitable for highest standard warp counts of 30s. For the regions of late and heavier rainfall this cotton is likely to be admirably suited as it is just late enough to escape the evil effects of late rains from which *Verum* 262 is liable to suffer a great deal through boll-shedding and opening of undeveloped bolls. In all respects it is a most desirable cotton and a start has been made to distribute the seed. The " Early " *Verum* strain has been isolated to replace the inferior " *Jari* " cotton at present grown in the Northern and Plateau districts of the Central Provinces. These districts are liable to suffer from early frost and rapidly drying soils which necessitate an early maturing strain of cotton. A new strain of *Bani—B.B.* 31 —has also been isolated which promises to do well. This cotton possesses a fine long staple suitable for spinning a warp yarn of 40s count.

The progress of *Verum* 262 in the field was closely watched throughout the growing season and careful and methodical records were maintained in regard to its behaviour in the various cotton tracts. The conditions during the season were far from ideal and the total crop as a whole showed a falling off as compared with the previous season. *Verum* 262, like most improved varieties, being comparatively less hardy, suffered somewhat heavily. Some of the experiments both at Akola and Nagpur were in consequence robbed of the greater part of their interest owing to the loss of their yield.

In order to obtain stocks of pure seed of *Verum* 262, pool ginning and selling were again resorted to and 11,162 bales were sold through the medium of the Agricultural Department at an average price of Rs. 212-8-0 per *candy* (F.O.R. Bombay basis), the corresponding average rates for *Broach* and *Oomras* over the same selling period being Rs. 189-12-0 and Rs. 156 respectively. There was roughly an area of 157,000 acres under *Verum* during the past season. Further extension is anticipated during the coming season.

BURMA.—*Myingyan Circle.*—The total area under *Pwinbyu Wagale* was 4,500 acres and a yield of nearly 280,000 *viss* of *kapas* was obtained. The Department's ginnery could tackle 129,415 *viss* only during the year and to this extent the Department has proper control. The rest of the outturn was taken up by the commercial ginneries.

The original *Pwinbyu* strain has suffered much contamination and is now gradually being replaced by the re-selected strain *C.* 19 which has a ginning outturn of 42 per cent. against the normal outturn of 32 per cent. for the unselected crop. This strain averaged 527.79 lbs. of seed cotton to an acre during the year and sufficient seed of this strain to sow 800 acres during the coming year was distributed.

The Indian Central Cotton Committee, Bombay, has agreed to finance for three years the new scheme of cotton development as outlined in the last year's report. The object in view is to concentrate for a time on better cultural methods which will increase yields, reduce seed rates, etc., while attempts to spread the Department's improved strains of cotton will go on simultaneously.

Two of the five hybrid strains of cotton retained from the crosses made in 1924 gave promising results in the preliminary yield test and will be further tested for yield against the local types during the coming year.

The reciprocal crosses made in 1928 were studied in the F_2 generation and most of them have been retained for further observation.

The crosses made in 1929 have been carried through for a study of the segregation of characters in F_2 generation.

West Central Circle.—In the West Central Circle this crop is of importance only in Thayetmyo District. Experiment work on it is confined to the Allanmyo Farm.

In the observation plots during the year under report the following cottons were under trial :—*Broach, Buri, Gadag, Verum, Garohil,* a *waygi* from Tatkon and another from Mahlaing, two American type cottons from the Central Provinces, and one, *No.* 10337, from the United States of Soviet Russia. Of these the Mahlaing *wagyi* will be continued into the chequer-board stage for the coming year and *Broach* will be continued for crossing. The other cottons showed very little promise.

No individual plant selection was carried out during the year. Hybridization between *Verum* and *Wagale* was carried out and ten crosses, 6 *Wagale* on *Verum* and 4 *Verum* on *Wagale*, set. There were grown in addition 249 crosses of previous years made up as follows :—*Wagyi-Wagale* 123, *Broach-Wagyi* 78, *Broach-Wagale* 48.

Selfed bolls were obtained from each of these. They have been tested for lint length, etc., and will be carried forward for further trial. The *Wagyi-Broach* and *Wagale-Broach* crosses are particularly promising.

In the chequer-board plots 18 *Wagale* selections were tested and 18 *Wagyi*. Twelve have been eliminated from each group leaving six in each group for further trial.

HYDERABAD STATE.—I. *Gaorani Tract.*—Efforts for the rehabilitation of the Hyderabad *Gaorani* (*Moglai*) cotton were continued. The *Gaorani* Protected Area was enlarged to include a part of Mominabad Taluqa of Bidar District. The distribution of *Gaorani* seed was continued on more or less the same lines as in the previous season. Nearly 3,600,000 lbs. of the famous *Umri* seed were purchased by the Department of Agriculture and given on *Takavi* loan system to the cultivators in the Protected Zone. The area sown with this seed was about 200,000 acres.

With a grant from the Indian Central Cotton Committee the work of the scientific improvement of *Gaorani* was started. A Cotton Research Botanist was appointed and stationed at Parbhani. He toured the *Gaorani* tract and selected from the cultivators' fields a large number of *Gaorani* plants. The seed of these was sown last year, and the best of their progenies were selected for a further trial.

A Cotton Markets Act for the better regulation and control of the cotton markets in H.E.H. the Nizam's Dominions was passed.

II. *Aurangabad District.*—The cotton grown in this district is a mixture of *Roseum* and *Indicum* varieties, with a predominance of the former. The work of replacing this mixture with *Banilla* cotton, which has found great favour in the neighbouring districts of the Bombay Presidency, was started last year. About 66,000 lbs. of *Banilla* seed were purchased from the Bombay Department of Agriculture and were distributed to the cultivators of a number of villages in the Aurangabad District. The reports received so far are encouraging and there is now a keen demand for the seed of this variety.

III. *Raichur and Kopbal Districts.*—The varieties grown in this district are chiefly *Kumpta* and *Dharwar-American*. Both the varieties in their existing state are badly mixed. The work of replacing them with improved types bred at Dharwar in the Bombay Presidency was taken in hand for the first time. About 200,000 lbs. of *Dharwar No. I* seed and 48,000 lbs. of *Gadag No. I* were purchased from the Cotton Sales Societies at Hubli and Gadag, respectively, and were distributed on the *Takavi* system to the cotton growers in this area. The supervisory staff engaged in the distribution of this seed is being paid from a grant made by the Indian Central Cotton Committee.

The tract proposed to be restricted to the growing of these improved strains was declared a Protected Zone under the Hyderabad Cotton Cultivation and Transport Act.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, (2) by the Cotton

Transport Act which prohibits and penalises the sowing or importing into the State for purposes of sowing of *Goghari* cotton seed or any other short-staple seed, and (3) by the control of ginning and pressing factories. Last year, as the crop in the Surat and Navsari Districts was late and affected with frost, the State considered it advisable instead of purchasing Surat and Navsari seed, to arrange locally to preserve the seed of cotton picked before the frost. The cultivators were provided with this seed and the crop was exceedingly good. But this year, in order to shut out all possibility of fear lest the quality should deteriorate, by the sowing of seed obtained locally, the best seed of 1027 *A.L.F.* was (as usual) secured by deputing the experienced Thandar of Valia with some leading cultivators of the State who purchased it with the assistance and guidance of the Cotton Superintendent, Surat. The seed thus obtained was distributed to the cultivators of the State from the different depôts by way of *Takavi* and the outturn and the quality of cotton was all that could be desired.

Rajpipla cotton is now recognized as equal to the very best type of Surat cotton and is largely sought after.

For the next year too, the State has, as usual, arranged to obtain the best seed of the improved strain of 1027 *A.L.F.* variety from Surat.

Mysore State.—Amongst *deshi* cottons, the most important is *Kumpta* cotton (*G. herbaceum*) grown in large areas in the northern districts of the State. The staple measures about $\frac{7}{8}$" with a ginning outturn of 25 per cent. As a result of selection two types have proved superior to the ordinary local cotton, one of which, known as *Selection* 69, occupies a large area (more than 20,000 acres) in the *Herbaceum* tract. The ginning percentage of this strain reaches 29. The lint of this selection is very much appreciated in the cotton market at Hubli.

The other varieties of *deshi* cottons found in other parts of the State are (1) *Nadam* cotton (*G. obtusifolium*) and black-seeded *Sannahatti* (*G. herbaceum* var. *melanosperma*).

As a result of hybridization between *G. arboreum* and *G. herbaceum*, a strain of cotton has been evolved which has a staple of fully one inch with a ginning outturn of 29 per cent. This strain, it is hoped, will be given out for trial on a field scale next season.

Dharwar-American cotton (*G. hirsutum*) is also grown to a large extent in the State. This variety of cotton—grown especially round about Banavar in the Hassan District—has a reputation in the Bombay market. Improvement by selection within this variety as well as by trials of a new cross (Mysore-American) which also possesses valuable staple, is being carried out in places where Dharwar-American is grown.

APPENDIX VIII.

BALANCE SHEET AS AT 31ST MARCH 1931.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		74,62,835 2 8	I. (a) Administration		10,64,705 1 9
			(b) Improvement of Cotton Marketing ..		70,203 8 10
INTEREST ACCOUNT.			(c) Seed Distribution and Extension Schemes		40,750 0 3
Amount received on Investments	8,87,194 1 2		II. *Technological Research.*		
Add—Refund of Income-tax deducted on interest ..	11,626 1 0		(1) Technological Laboratory.		
	8,98,820 2 2		(a) Capital Expenditure.		
			(i) Lands and Buildings	3,55,797 9 11	
Less— Rs. a. p.			(ii) Machinery	82,340 10 1	
(1) Interest paid in advance at the time of purchasing Government Securities (since recovered) and Bank's commission 39,710 12 10			(iii) Freight	7,502 2 8	
			(iv) Apparatus and Equipment ..	41,558 3 7	
(2) Income-tax deducted on interest. . 17,111 0 6			(v) Machinery Workshop	5,789 8 3	
			(b) Working Expenses	9,21,088 10 7	
(3) Interest credited to Provident Fund Account 4,886 6 2			(2) Provincial	18,426 8 0	
					14,32,303 5 1
(4) Bank's withdrawal charges for Securities sold 1,690 8 0			III. Research Studentships		1,85,419 3 3
			AGRICULTURAL RESEARCH.		
(5) Provision for Sinking Fund .. 1,735 7 0			IV. Bombay	4,94,105 10 1	
	65,134 2 6		V. Madras—Herbaceum	76,505 4 11	
		8,33,685 15 8	,, Pempheres and Physiological ..	2,224 12 7	
Profit on conversion of 6 per cent. Tax-free Bonds into 5 per cent. Taxable Loan		5,000 0 0	,, Fodder Cholam	1,255 0 0	
Sinking Fund Account		1,735 7 0	VI. Punjab—Botanical	3,03,320 3 4	
Miscellaneous Receipts		10,298 15 5	,, Entomological	81,739 4 4	
			VII. Central Provinces	2,13,223 15 4	
			VIII. United Provinces	1,26,123 6 3	
			IX. Institute of Plant Industry, Indore	9,44,676 12 0	
			X. Sind	81,781 12 3	
			XI. Burma	2,906 15 5	
			XII. Hyderabad	41,745 1 5	
			XIII. Bikaner	16,610 0 0	
					23,86,218 1 11
			Loans recoverable account		12,805 0 0
			Suspense Account		2,684 11 0
			By Balance		31,18,266 8 8
Grand Total ..	....	83,13,555 8 9	Grand Tota ..	....	83,13,555 8 9

BALANCE SHEET AS AT 31ST MARCH 1931.

Provident Fund Account.

RECEIPTS.						INVESTMENTS.			
	Rs.	a.	p.	Rs.	a. p.		*Face Value.*	*Cost.*	
Subscribers' Contributions	73,522	6	5				Rs.	Rs.	a. p.
Less—Refunds to subscribers resigned ..	2,909	4	10			*By Balances*—			
				70,613	1 7	(1) 3½% Government Promissory Notes	85,600	59,754	3 1
Committee's Contribution	71,674	10	8			(2) 5% 1939-44 Taxable Loan	25,600	24,606	15 6
Less—Payments to subscribers resigned. .	564	13	3			(3) 6% Government Bonds, 1933-36	24,100	24,210	10 0
				71,109	13 5	(4) 4% Government Loan, 1934-37	2,000	1,795	0 0
Recoveries against advances				8,786	3 0	Fixed Deposit with the Central Bank of India ..	....	2,800	0 0
Suspense receipts				5	13 0	Balance in Current Account with the Imperial Bank of India, Bombay	....	21,248	8 5
				1,50,514	15 0				
Deductions—									
(1) Advances made				14,402	12 0				
(2) Accrued interest credited to subscribers on 31st March 1931				1,696	14 0				
				16,099	10 0				
					1,34,415 5 0				
Grand Total ..				....	1,34,415 5 0	Grand Total ..	....	1,34,415	5 0

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH 1931.

RECEIPTS.	Rs. a. p.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
Opening Balance	29,78,503 1 2		I. Administration of the Committee (including Improvement of Cotton Marketing and Seed Distribution and Extension)		1,78,294 7 9
Less—Payments made to the Trustees, Committee's Provident Fund ..	12,138 10 0		II. Agricultural Research Grants-in-Aid		3,76,304 8 3
		29,66,364* 7 2	III. Technological Research		1,83,813 1 5
Receipts under Section 12 of the Indian Cotton Cess Act, 1923		7,47,669 15 8	IV. Closing Balance— (Government Paper at cost.)		
Other Receipts†		2,352 4 0		*Face Value.*	
Interest on Investments ..		1,55,781 10 3	3½% Government Promissory Notes .. .. .. Rs. 7,56,300 ..	5,39,864 6 5	
			5% Ten Year Bonds, 1935 .. .. „ 2,75,000 ..	2,40,032 13 0	
			5% Indian War Loan, 1929-47 .. .. „ 7,88,000 ..	7,65,220 12 10	
			4½% Government of India Loan, 1955-60 .. .. „ 26,600 ..	25,004 0 0	
			5% Government of India Loan, 1939-44 .. .. „ 3,09,000 ..	2,96,679 13 6	
			6% Government of India Bonds, 1933-36 .. .. „ 1,04,900 ..	1,04,900 0 0	
			‡6% Bombay Municipal Debentures, 1954 .. .. „ 50,000 ..	56,500 0 0	
			6% Rangoon Municipal Coupon Debentures, 1955 .. „ 3,83,500 ..	4,15,328 2 0	
			6% Karachi Port Trust Coupon Debentures, 1956 .. „ 1,30,000 ..	1,41,212 8 0	
			4½% India Sterling Stock 1950-55 Bearer .. .. £ 16,000 ..	1,95,621 14 4	
			4½% India Sterling Stock 1958-68 Bearer .. .. £ 8,000 ..	93,762 12 6	
			3½% India Sterling Loan 1931 Bearer .. .. .. £ 16,000 ..	1,28,579 12 8	
			3 Months Government Treasury Bills .. .. .. Rs. 25,000 ..	24,609 6 0	
			6 Months Government Treasury Bills .. .. .. „ 25,000 ..	24,320 5 0	
			Fixed and Call Deposits (with approved Banks)	33,000 0 0	
			Imperial Bank of India, Limited, Current Account	31,129 14 5	
			Imprest—Committee's Account as certified by the Secretary .. Rs. 1,500		
			Technological Laboratory as certified by the D. T. L. „ 500		
			Cotton Research Botanist, Punjab, as certified by the Cotton Research Botanist, Punjab .. .. „ 500	2,500 0 0	
			Suspense (Recoverable)	2,684 11 0	
			Loans (Recoverable)	12,805 0 0	
			Total Closing Balance ..		31,33,756 3 8
Total ..	....	38,72,168 5 1	Total ..		38,72,168 5 1

* This amount includes Rs. 848-9-0 on account of Sinking Fund.

† This includes Rs. 886-14-0 against provision for Sinking Fund for the year 1930-31.

‡ Deposited with the Imperial Bank of India, Ltd., for security against any overdraft that may be required by the Committee.

§ This amount includes Rs. 1,735-7-0 against Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required, and certify that to the best of our information and explanations received the above Statement is a correct abstract of the figures appearing in the books and is drawn up in conformity with the rules under the Indian Cotton Cess Act, 1923.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors.

BOMBAY, *30th April* 1931.

PROVIDENT FUND ACCOUNT AS ON 31ST MARCH 1931.

	Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1930		94,385 12 9
Subscribers' Contributions	19,597 5 0	
Less—Refunds to Subscribers .. Rs. a. p. 239 14 0		
Refunds for excess recovery .. 19 2 0	259 0 0	
	19,338 5 0	
Add—Recoveries against Advances	4,772 9 0	
	24,110 14 0	
Less—Advances to Subscribers	8,069 10 0	
		16,041 4 0
Interest received on Investments .. 5,426 7 10		
Interest received on advances to subscribers 33 3 6		
Refund of Income-tax deducted from interest received during 1929-30 .. 227 14 0	5,687 9 4	
Less—		
Interest paid to subscribers who have resigned during the year 2 8 4		
Advance interest paid for securities purchased (since recovered) .. 446 14 8		
Income-tax deducted from Interest .. 242 0 7		
Bank's commission for collection of interest 14 4 0		
Loss on conversion of Tax Free Loans into Taxable Loans 314 15 6	4,020 11 1	
		4,666 14 3
Suspense receipts		5 13 0
Committee's contribution due from the Indian Central Cotton Committee at 100 per cent.	19,578 3 0	
Less—Refunds to subscribers who have resigned ..	239 14 0	19,338 5 0
Total ..	....	1,34,438 1 0

	Rs. a. p.	Rs. a. p.
By Cost of Stationery		22 12 0
Balance—		
(Government Paper at cost.) *Face Value.*		
3½% Government Pro. Notes .. Rs. 85,600 ..	59,754 3 1	
5% Taxable Loan, 1939-44 .. „ 25,600 ..	24,606 15 6	
6% Government Bonds, 1933-36 „ 24,100 ..	24,210 10 0	
4% Government Loan, 1934-37 . „ 2,000 ..	1,795 0 0	
Fixed Deposit	2,800 0 0	
Balance in Current Account with the Imperial Bank of India, Ltd.	21,248 8 5	
		1,34,415 5 0
Total ..	....	1,34,438 1 0

Examined and found correct.

Bombay, 30th April 1931.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH SCHEMES UP TO 31ST MARCH 1931.

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total Expenditure up to 31st March 1931.	Expenditure from Capital Grant on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(a) Lands and buildings.	(b) Machinery and apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
II. *Technological Research.*	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(1) *Technological Laboratory.*									
(a) Capital Expenditure.	5,04,799 3 8	Permanent.	1923 Jan. 1924.	14,32,503 5 1	3,55,797 9 11	1,37,190 8 7	....	....	*Cotton Breeding Scheme closed down in July 1929.
(b) Working Expenses ..	9,21,088 10 7		April 1928.		....	....	26,321 1 8	8,94,767 8 11	
(2) Provincial	18,426 8 0				....	....	....	18,426 8 0	
AGRICULTURAL RESEARCH GRANTS:									
IV. *Bombay Schemes.*									†Rs. 2,030 transferred to Capital from working grant.
(1) Surat Physiological ..	2,91,445 0 0	10 years.	Sept. 1923.	1,97,053 8 10	....	....	16,424 4 5	1,80,629 4 5	
(2) Surat Boll-worm ..	1,20,720 0 0	7½ years.		1,15,721 6 8	....	....	3,912 3 11	1,11,809 2 9	
(3) Dharwar Wilt and Cotton Breeding*	2,63,545 0 0	10 years.		1,59,551 3 7	....	....	13,703 12 11	1,45,847 6 8	‡The balance of this amounting to Rs. 3,100-13-5, lapsed on revision.
(4) Khandesh Cotton Breeding	25,000 0 0	5 years.	Oct. 1926.	21,465 3 0	....	....	....	21,465 3 0	
(5) Co-ordination of Cotton Research	98,655 0 0	5 years.	Not started.	314 4 0	....	....	....	314 4 0	
V. *Madras Schemes.*									
(1) Herbaceum	1,07,460 0 0	10½ years.	Decr. 1923.	76,505 4 11	....	....	3,781 1 6	72,724 3 5	Rs. 50,202-12-10 transferred from Recurring grant to Capital.
(2) Pempheres and Physiological	66,000 0 0	2½ years.	Not started.	2,224 12 7	....	....	....	2,224 12 7	
(3) Fodder Cholam.									
(a) Capital Expenditure ..	900 0 0	3 years.	14th Jan. 1931.	1,255 0 0	....	864 10 0	....	....	
(b) Working Expenses ..	4,716 0 0			....	....	....	12 14 3	377 7 9	
VI. *Punjab Schemes.*									
(1) Botanical.									
(a) Capital Expenditure ..	†31,330 0 0	5 years.	Aug. 1925. 1st April 1930.	3,03,320 3 4	22,227 5 0	9,102 11 0	....	....	¶Figures for 1930-31 taken from budget estimates and subject to revision on receipt of Annual Returns.
(b) Working Expenses ..	†2,22,970 0 0 / 3,00,930 0 0				....	....	¶ 14,845 7 0	2,57,144 12 4	
(2) Entomological.									
(a) Capital Expenditure ..	6,000 0 0	5 years.	May 1926.	81,739 4 4	....	5,826 3 10	....	....	
(b) Working Expenses ..	85,000 0 0				....	....	6,667 8 0	69,245 8 6	
VII. *Central Provinces*	†61,000 0 0	2½ years.	Oct. 1923.	2,13,223 15 4	....	....	3,883 4 11	2,09,340 10 5	
VIII. *United Provinces.*	3,22,165 0 0	8 years.	April 1926.						
(1) Pink Boll-worm Scheme.									
(a) Capital Expenditure ..	54,000 0 0	6½ years.	April 1925.	1,26,123 6 3	....	47,411 12 6	....	....	
(b) Working Expenses ..	56,000 0 0				....	....	3,164 15 9	75,546 10 0	
(2) Recurring grant for staff ..	25,200 0 0	5 years.	Oct. 1926.		....	....	....		
IX. *Institute of Plant Industry, Indore.*									
(a) Capital Expenditure ..	‖2,83,536 11 9	Permanent.	Oct. 1924.	9,44,676 12 0	2,12,552 11 5	70,984 0 4	....	....	
(b) Working Expenses ..	6,61,140 0 3				....	....	31,857 4 4	6,29,282 11 11	
X. Sind	1,04,000 0 0	5 years.	July 1927.	81,781 12 3	....	....	6,433 5 2	75,348 7 1	
XI. Burma—Capital	3,000 0 0	....	....	2,906 15 5	....	2,906 15 5	....	....	
XII. Hyderabad	1,22,500 0 0	5 years.	May 1929.	41,745 1 5	....	....	2,719 4 11	39,025 12 6	
XIII. *Bikaner.*									
(a) Capital Expenditure ..	14,500 0 0	5 years.	Jan. 1931.	16,610 0 0	....	14,500 0 0	....	....	
(b) Working Expenses ..	38,200 0 0				....	....	....	2,110 0 0	
Total ..	....	....	....	38,18,721 7 0	5,90,577 10 4	2,88,786 13 8	1,33,726 8 9	28,05,630 6 3	

APPENDIX IX.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1.	Secretary, Indian Central Cotton Committee.	Mr. J. H. Ritchie, M.A., B.Sc., I.A.S. ..	On deputation from the Central Provinces Department of Agriculture.
2.	Deputy Secretary, Indian Central Cotton Committee.	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S. .	On deputation from the Madras Department of Agriculture.

TECHNOLOGICAL LABORATORY, BOMBAY.

3.	Director, Technological Laboratory ..	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.) ..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
4.	Spinning Master, Technological Laboratory.	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
5.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc. Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
6.	Senior Research Assistant (Assistant Technologist).	Mr. D. F. Kapadia, B.Sc. Tech. (Manch.), B.A. (Bom.).	Research Scholar, Technological Laboratory (Textile Physics).
7.	Senior Research Assistant (Physicist)..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Do. do.
8.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Do. do.
9.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Muktesar, U. P.
10.	Statistician	Mr. V. Venkatraman, M.A. (Madras).. ..	Recently Statistical Assistant, Labour Office, Government of Bombay, Bombay.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

11.	Temporary Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).	
12.	Temporary Research Assistant	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Do.	do.
13.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	—	
14.	Junior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.) ..	—	
15.	Junior Tester	Mr. K. G. Deo	—	
16.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	—	
17.	Junior Tester	Mr. K. S. Marar, B.A., LL.B.	—	
18.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	—	
19.	Junior Tester	Mr. G. D. Bhide, B.Sc.	—	
20.	Junior Tester	Mr. K. V. N. Nayar	—	
21.	Junior Tester	Mr. V. N. Modak, B.Sc.	—	
22.	Junior Tester	Mr. L. V. Sundararaman, B.A.	—	
23.	Junior Tester	Mr. P. S. Sambamurthi	—	
24.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	—	
25.	Junior Tester	Mr. Sassoon Samson, B.Sc.	—	
26.	Junior Tester	Mr. A. J. Farid	—	
27.	Junior Tester	Mr. U. K. Benegal, B.A.	—	
28.	Junior Tester	Mr. P. V. Nachane, B.Sc.	—	
29.	Spinning Assistant	Mr. N. Iyengar	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE.

30.	Director, Institute of Plant Industry, Indore.	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.)	Recently Botanist and Plant Breeder in the Department of Agriculture, Iraq.
31.	Assistant in charge of Extension work..	Mr. K. R. Joshi, L.Ag. (Nagpur)	Lent by Indore State Agricultural Department. 15 years in Indore State Agricultural Department. On deputation to Jaipur State.
32.	Personal Assistant to the Director ..	Mr. Misri Lal Saksena, L.Ag. (Cawnpore)..	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.
33.	Assistant in charge of Seeds and Experimental Farm.	Mr. G. C. Tambe, B.Ag. (Bombay)	On deputation to Jhalawar State.
34.	Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay) ..	Research Student, Indian Central Cotton Committee.
35.	Junior Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	—
36.	Junior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad) ..	—
37.	Junior Farm Assistant	Mr. S. C. Talesra, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
38.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	—

BOMBAY RESEARCH SCHEMES.

(i) *Physiology.*

39.	Cotton Physiologist in charge of Cotton Research Scheme No. I—Physiology of the Cotton Plant in Gujerat.	Mr. K. V. Joshi, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture,
40.	Senior Assistant	Mr. S. V. Godbole, M.Sc., B.Ag. (Bombay) ..	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(i) *Physiology*—contd.

41.	Junior Assistant	Mr. N. M. Nitimargi, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture. (*On leave.*)
42.	Junior Assistant (Acting)	Mr. G. B. Patel, B.Ag.	On deputation from Bombay Department of Agriculture.
43.	Bio-Chemical Assistant	Mr. R. B. Gode, M.Sc.	—
44.	Junior Assistant	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
45.	Junior Assistant	Mr. S. S. Sirur, B.Ag.	—

(ii) *Mycological.*

46.	Special Cotton Mycologist in charge of the Cotton Wilt Disease, Dharwar.	Mr. G. S. Kulkarni, M.Ag. (Bombay) ..	Plant Pathologist in the Bombay Department of Agriculture. On deputation.
47.	Senior Assistant	Dr. B. B. Mundkur, M.A. (Madras), Ph.D. of Iova University (U.S.A.).	—
48.	Junior Assistant	Mr. J. D. Ranadive, B.Ag., B.Sc.	Research Student, Indian Central Cotton Committee.

(iii) *Entomological (Propaganda Scheme).*

49.	Cotton Entomologist, Propaganda Scheme of clean-up measures against Spotted Boll-worm, Broach.	Mr. B. P. Deshpande, M.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
50.	Graduate Assistant (Cotton Boll-worm Control Officer).	Mr. G. P. Pathak, B.Ag.	Do. do.
51.	Graduate Assistant (Cotton Boll-worm Control Officer).	Mr. K. D. Naik, B.Ag.	Do. do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(iii) *Entomological (Propaganda Scheme)*—contd.

52.	Graduate Assistant (Cotton Boll-worm Control Officer).	Mr. L. N. Patel, B.Ag.		On deputation from Bombay Department of Agriculture.
53.	Research Assistant	Mr. M. S. Patel, B.Ag. (Bombay)		—

(iv) *Khandesh Cotton Breeding Scheme.*

54.	Graduate Assistant	Mr. N. R. Yardi, B.Ag. (Bombay)		—
55.	Graduate Assistant	Mr. M. S. Pandya, B.Ag. (Bombay)		On deputation from Bombay Department of Agriculture.
56.	Non-Graduate Assistant	Mr. P. A. Rao		—

BOMBAY SEED DISTRIBUTION SCHEMES.

(i) *Hubli and Gadag.*

57.	Graduate Assistant	Mr. B. S. Patil, B.Ag. (Bombay)		—
58.	Graduate Assistant	Mr. B. M. Dhumma, B.Ag. (Bombay)		—

(ii) *Gadag Supplementary Scheme.*

59.	Manager, Gadag Farm	Mr. G. Y. Kurli		On deputation from Bombay Department of Agriculture.

(iii) *Surat.*

60.	Graduate Assistant	Mr. H. U. Vora, B.Ag.	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES—*contd.*

(iv) *Khandesh (Banilla Scheme).*

61.	Cotton Supervisor in stages III, IV, and V.	Mr. S. V. Shevde, L.Ag.	On deputation from Bombay Department of Agriculture.	
62.	Farm Superintendent, Patonda, Taluka Amalner.	Mr. G. S. Moghe, B.Ag.	Do.	do.
63.	Graduate Assistant in stages III, IV and V.	Mr. R. B. Nimbalkar, B.Ag.	Do.	do.

SIND PHYSIOLOGICAL RESEARCH SCHEME.

64.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)	—	
65.	Senior Assistant	Mr. R. D. Rege, B.A., M.Sc. (Bom.), Ph.D. (Lond.), A.I.I.Sc.	—	
66.	Junior Assistant	Mr. Rustom M. Ranji, Dip. in Ag. (Bombay)	—	
67.	Junior Assistant	Mr. R. G. Deshpande, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.	

SIND SEED DISTRIBUTION SCHEME.

68	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.	
69.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. K. H. Advani, B.Ag. (Bombay), M.Sc. (Texas, U.S.A.) in Agronomy and Agricultural Economics.	—	
70.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. R. N. Gidwani, B.Ag. (Bombay).. ..	Research Student, Indian Central Cotton Committee.	
71.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj P. Tejwani	On deputation from the Sind Agricultural Department.	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

SIND SEED DISTRIBUTION SCHEME—*contd.*

72.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani	—
73.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Syed Ahmedshah Hatimshah	—
74.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Partabsingh J. Bakshi, B.Sc.	—

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

75.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon), F.L.S. ..	Holds permanent post in Government service.
76.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag. and Post Graduate, Pusa.	On deputation from Central Provinces Agricultural Department.
77.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
78.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Agricultural Department.
79.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.
80.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do. do.
81.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	—

CENTRAL PROVINCES SEED DISTRIBUTION SCHEME.

82.	Agricultural Assistant	Mr. J. N. Kelkar, B.Ag. (Nagpur)	—
83.	Agricultural Assistant	Mr. S. V. Bokare, B.Ag. (Nagpur)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

CENTRAL PROVINCES SEED DISTRIBUTION SCHEME—*contd.*

84.	Agricultural Assistant	Mr. N. G. Sirpurkar, B.Ag. (Nagpur) ..	—
85.	Agricultural Assistant	Mr. K. M. Gadre, B.Ag. (Bombay)	—
86.	Agricultural Assistant	Mr. L. H. Mirajkar, B.Ag. (Bombay) ..	—
87.	Agricultural Assistant	Mr. S. T. Purandare, B.Ag. (Bombay) ..	—
88.	Agricultural Assistant	Mr. R. B. Patel, B.Ag. (Bombay)	—
89.	Agricultural Assistant	Mr. V. K. Joshi, B.Ag. (Bombay)	—
90.	Agricultural Assistant	Mr. T. V. Muley, B.Ag. (Bombay)	—
91.	Agricultural Assistant	Mr. S. B. Salunkhe, B.Ag. (Bombay) ..	—

MADRAS RESEARCH SCHEMES.

(i) *Herbaceum.*

92.	Senior Assistant	Mr. R. Balasubramaniyam, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.
93.	Assistant	Mr. G. Seshadri Ayyangar, M.A.	—
94.	Assistant	Mr. V. Ramaswami Mudaliar, B.A.	—
95.	Sub-Assistant	Mr. Devasirvatham, Government Tech. Exam. in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

(ii) *Fodder Cholam.*

96.	Assistant	Mr. S. Sundaram, B.A., B.Sc. (Ag.)	On deputation from Madras Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

97. Acting Cotton Research Botanist ..	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A., Trinidad.	Indian Central Cotton Committee's Research Scholar and State Research Scholar. On deputation from the Punjab Department of Agriculture.
98. Assistant to Cotton Research Botanist .	Chaudhri Mohd. Akbar, L.Ag.	On deputation from the Punjab Department of Agriculture.
99. Technical Assistant	Bh. Sarup Singh, L.Ag.	On deputation from the Punjab Department of Agriculture.
100. Junior Research Assistant	Mr. M. Akbar Ali, B.Sc. (Post Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from the Punjab Department of Agriculture.
101. Technical Assistant	Mr. Ramesh Chandar, M.Sc. (Agri.)	On deputation from the Punjab Department of Agriculture.
102. Technical Assistant	Ch. Mohd. Rashid Khan, L.C. course ..	On deputation from the Punjab Department of Agriculture.
103. Temporary Assistant Physiologist ..	Mr. Sant Singh Varma, M.Sc. (Benares) ..	Research Student, Indian Central Cotton Committee.
104. Statistical Assistant	Mr. S. Subramania Iyer, B.A. (Hons.), M.A. (Madras).	—

(ii) *Entomological.*

105. Assistant Cotton Entomologist in charge, Pink Boll-worm Research Scheme.	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	—
106. Field Assistant, Sialkot Research Work...	Mr. Ladha Ram, B.Sc.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(ii) *Entomological*—contd.

107. Field Assistant, Rohtak Research Work.	Mr. Ganda Ram, B.Sc., F.E.L.	—
108. Field Assistant, Lyallpur Research Work	Mr. Nazir Ahmad, M.Sc.	—
109. Statistical Assistant	Mr. Sardari Lal, B.Sc. (Agri.)	—

(iii) *White Fly.*

110. Assistant Cotton Entomologist	Mr. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee. On deputation from the Punjab Department of Agriculture.
111. Field Assistant	Mr. Piare Mohan Varma, B.Sc. (Hons.) (Punjab), M.Sc.	Research Student, Indian Central Cotton Committee.

UNITED PROVINCES RESEARCH SCHEME.

112. Special Research Assistant, Pink Bollworm Investigations.	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab).	Research Student, Indian Central Cotton Committee.

HYDERABAD RESEARCH SCHEMES.

(i) *Botanical.*

113. Cotton Research Botanist	Rai Saheb Kalidas Sawhney, M.Sc. (Punjab)	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
114. Assistant to Cotton Reseach Botanist ..	Mr. V. K. Bederker, B.Ag. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.
115. Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona Agril. College).	On deputation from the Bombay Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS, AS ON AUGUST 31ST, 1931—*concld.*

HYDERABAD RESEARCH SCHEME—*contd.*

(ii) *Cotton Survey.*

116. Assistant Cotton Research Botanist	..	Mr. B. B. Mulchandani, B.Ag. (Bombay)	.. On deputation from the Bombay Department of Agriculture.

HYDERABAD SEED DISTRIBUTION SCHEME.

117. Inspector	..	Mr. M. V. Chitnis	—

BIKANER GANG CANAL RESEARCH SCHEME.

118. Cotton Assistant	..	Mr. N. S. Apte, B.Ag.	—

TECHNOLOGICAL ASSISTANTS PAID DIRECT BY INDIAN CENTRAL COTTON COMMITTEE.

119. Under Cotton Specialist, Coimbatore	..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.
120. Under Cotton Breeder, Dharwar	..	Mr. H. R. Nayak, Inter Science (Madras)	.. Formerly Junior Tester at Technological Laboratory, Bombay.
121. Under Cotton Research Botanist, Lyllapur.		Mr. K. R. Sen, M.Sc. (Dacca) ..	.. Research Student, Indian Central Cotton Committee.

APPENDIX X.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	Sohan Singh Bindra, M.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	Agricultural Department, Kenya.	Late Assistant Entomologist, Pink Boll-worm Research Scheme, Punjab.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Acting Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Jiwan Singh, M.Sc. (Punjab).	Nagpur	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
6 ,,	Ilabonto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany. Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923.	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Bombay Agricultural Service. Cotton Breeder, Sind.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924.	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc. Honours School (Punjab).	Cawnpore	Cotton Entomology.	Assistant Entomologist, Pink Boll-worm Investigation, United Provinces.	Indian Central Cotton Committee.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology..	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925.	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Research Scheme.

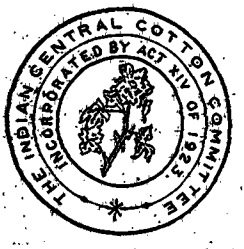
Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1925.	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Technical Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology.	Punjab Agricultural Department. Entomological Assistant, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
8					
,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Dharwar, up to 31st July 1929.	Resigned to proceed to England for further studies.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Junior Assistant, Dharwar Wilt Scheme.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
,,	L. N. Rao, M.Sc. (Calcutta)..	Do. ..	Cotton Microscopy .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926.	D. F. Kapadia, B.A., B.Sc. (Tech. Manchester).	Do. ..	Cotton Technology .	Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

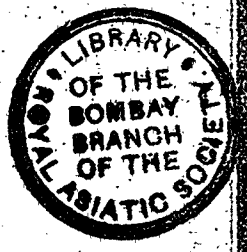
Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	Ram Saran Koshal, M.Sc. (Punjab).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology ..	Bombay Agricultural Department. Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	....
,,	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., M.Sc. (Bombay).	Coimbatore.. ..	Cotton Bio-Chemistry.	Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay)	Institute of Plant Industry, Indore.	Cotton Botany ..	Bombay Agricultural Department. Cotton Supervisor, Indus Right Bank Cotton Extension Scheme, Sind.	Indian Central Cotton Committee.
,,	S.C. Talesara, B.Ag. (Bombay)	Do. ..	Do. ..	Junior Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
1927.	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Technological Assistant, Coimbatore.	Indian Central Cotton Committee.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-Chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	Government Scholar for study abroad.	....
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do. ..	Do. ..	....

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
9 1927	Shripad Shamrao Rane, M.Sc. (Benares Hindu University)	Institute of Plant Industry, Indore.	Cotton Physiology .	Unemployed	....
,,	Sant Singh Varma, M.Sc. (Benares Hindu University)	Dharwar	Cotton Physiology in connection with Cotton Wilt investigation.	Temporary Assistant Physiologist, Lyallpur, Punjab Botanical Scheme.	Indian Central Cotton Committee.
,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Unemployed	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy .	Agricultural Officer, Bikaner State.	....
1928.	K. Dharmarajulu, B.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Junior Assistant, Dharwar Wilt Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology	Field Assistant, White Fly Investigation, Punjab.	Indian Central Cotton Committee.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy .	Senior Assistant to Cotton Supervisor, Left Bank, Cotton Extension Scheme, Sind.	Indian Central Cotton Committee.
5 ,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (Univ. of Edin.)	Institute of Plant Industry, Indore.	Do. ..	Madras Agricultural Service. Personal Assistant to Director of Agriculture.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Temporary Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1929.	Shrinagabhushana, B.Sc. ..	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Temporary Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
3 ,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Research Student	
,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.), Punjab.	Do. ..	Do. ..	Do. ..	Under training.
1930.	Madan Lal Bhatia, M.Sc. (Punjab).	Do. ..	Entomology ..	Do. ..	
,,	Bhola Nath, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Do. ..	
4 ,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	Do. ..	Resigned.
,,	Brajandra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	Do ..	
1931.	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Do. ..	Do. ..	
,,	K. R. Dube, B.Ag. (Nagpur)	Nagpur	Do. ..	Do. ..	Under training.
4 ,,	Santokh Singh Jaggi, B.Sc. (Agri.), (Punjab).	Lyallpur	Do. ..	Do. ..	
,,	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do.	Do. ..	
50 Total.					

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants.





ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST 1932.

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ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

Year ending 31st August

1932.

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1932.

CHAPTER I.

THE Central Cotton Committee was constituted by Resolution No. 404-22, dated the 31st March 1921, of the Government of India in the Department of Revenue and Agriculture. Originally it was purely an advisory body, but with the passing of the Cotton Cess Act in 1923, it was incorporated and provided with funds "for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee thus fulfils two main functions. It advises the Government of India and Local Governments on matters connected with the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention. Secondly, it provides funds for research into cotton problems designed for the benefit of the whole of India or for large tracts where cotton is an important crop. The research part of the Committee's work has now reached the stage of showing practical results, as will be seen in this report.

The Committee, in addition, serves as a common meeting-ground for all branches of the cotton industry. All main interests connected with cotton consisting of the grower, the agricultural expert, the ginner, the exporter and the millowner are represented on the Committee, as will be seen below, and there is no branch of cotton industry in India on which the Committee cannot give expert advice. The Committee, however, pays special attention to the interests of the grower whose welfare is its chief concern.

PERSONNEL.

2. The members of the Committee on the 31st August 1932 were as follows. Under the Indian Cotton Cess Rules, members hold office for three years and one-third of their number retire each year in rotation.

(1) PRESIDENT.—Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in agricultural matters, *ex-officio*.

(2) Representatives of Agricultural Departments.

Madras	Mr. S. V. Ramamurty, I.C.S., Director of Agriculture.
Bombay	The Director of Agriculture.
United Provinces ..	Mr. P. B. Richards, I.A.S., Entomologist to Government.
Punjab	The Director of Agriculture.
Central Provinces ..	Mr. F. J. Plymen, C.I.E., I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture.

(3) The Director-General of Commercial Intelligence and Statistics, *ex-officio*.

(4) Representatives of Chambers of Commerce and Associations.

The East India Cotton Association	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E.
The Bombay Mill-owners' Association. .	Mr. S. D. Saklatvala.
The Bombay Chamber of Commerce ..	Sir Joseph A. Kay, Kt. (*Vice-President*).
The Indian Merchants' Chamber	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. J. O. G. Barnes.
The Ahmedabad Mill-owners' Association . .	Sheth Naranlal Jivanlal.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce ..	Mr. J. Tinker.
The Empire Cotton Growing Corporation	Mr. W. Roberts.

(5) and (6) Commercial Representatives nominated by Local Governments.

Central Provinces ..	Mr. Y. G. Deshpande. Rao Bahadur G. R. Kothare, M.L.C.
Madras	Mr. Robert Lee.
Punjab	Khan Bahadur Sardar Habibullah, M.L.C.
Bengal	Mr. Nalini Ranjan Sarkar.

(7) Co-operative Banking Representative—Sardar Sampuran Singh.

(8) REPRESENTATIVES OF COTTON GROWING INDUSTRY.

Madras	The Honourable Mr. V. C. Vellingiri Gounder. M. R. Ry. K. Sarabha Reddi Garu, M.L.C.
Bombay	Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Saheb Chinbasappa Shidramappa Shirahatti.
United Provinces ..	Khan Bahadur Maulvi Mohammad Obaidur Rahman Khan, M.L.C. Rao Bahadur Rao Bikram Sinha, M.L.C.
Punjab	Major D. Vanrenen. Mian Nurullah, M.L.C.
Central Provinces and Berar.	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe, M.L.C.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General and Secretary to Government, Department of Commerce and Industries.
Baroda State	Mr. C. V. Sane, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Agricultural Adviser to Gwalior Government.
Rajputana and Central India States	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Dr. W. Burns, I.A.S., Principal, Agricultural College, Poona.
3. Dr. L. C. Coleman, C.I.E., Director of Agriculture, Mysore State.
4. M. R. Ry. V. Ramanatha Ayyar, Avl., Cotton Specialist, Coimbatore.
5. Mr. C. R. Palairet, Member for Commerce and Industry, Holkar Durbar, Representative of the Indore State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind, Karachi.
7. Mr. Girdharlal B. Kotak, Representative of the Karachi Indian Merchants' Association, Karachi.
8. Rai Saheb Ram Prasad Singh, Assistant Economic Botanist to Government, United Provinces.
9. Mr. Mohammad Azhar Ali, M.L.A., Lucknow.
10. Mr. Gulam Mohammad Khan, Representative of the Cotton Growers of Sind.

11. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.

Secretary.—Mr. J. H. Ritchie, I.A.S. (on leave from the 25th June 1932).

Deputy Secretary.—Mr. P. H. Rama Reddi, I.A.S. (Officiating Secretary).

Director, Technological Laboratory.—Dr. Nazir Ahmad.

Publicity Officer.—Mr. R. D. Mihra.

Sir Joseph A. Kay was re-elected Vice-President for the year 1932-33. He was on leave out of India from April 11th to October 27th, 1932.

SUB-COMMITTEES.

3. *Standing Finance Sub-Committee.*—The following members were appointed to form the Standing Finance Sub-Committee as required by the Rules under the Indian Cotton Cess Act :—

Sir Joseph A. Kay (*Vice-President*), *Chairman :* Dewan Bahadur Sir T. Vijayaraghavacharya (*ex-officio*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur M. G. Deshpande, Mr. D. McCallum and Mr. Chunilal B. Mehta.

Mr. Vonesch was on leave out of India from April 11th to September 5th and his place on the Sub-Committee was temporarily filled by Sheth Naranlal Jivanlal.

Mr. McCallum resigned from the Committee on July 12th, 1932, and Mr. J. O. G. Barnes was appointed in his place.

The Sub-Committee met eight times during the year.

4. The *Local Sub-Committee* consists of all members living in or near Bombay though any member of the Committee may attend its meetings. The Sub-Committee was constituted as follows :—

Dewan Bahadur Sir T. Vijayaraghavacharya (*President*), Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur M. G. Deshpande, Mr. D. McCallum and Mr. Chunilal B. Mehta.

Mr. McCallum resigned in the course of the year and his place was taken by Mr. J. O. G. Barnes.

Eight meetings were held during the year. The Sub-Committee, at a special meeting held on the 15th December 1931, discussed the question of granting licenses by the Director of Agriculture, Bombay Presidency, to the importers of cotton, Hyderabad State, and it was attended by invitation by the following :—

Mr. S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
Mr. M. V. Chitnis, Cotton Marketing Officer, Kopbal.
Rao Saheb V. P. Chavadi, President, Taluka Local Board, Gadag.
Mr. L. B. Laksmeshwar, President, Taluka Development Association, Gadag and Member, Divisional Board of Agriculture, Dharwar.
Mr. T. V. Koti, President, Gadag-Bettigeri Municipality.
Mr. M. V. Koti, Vice-President, Dalals' Association, Gadag, and Member, Divisional Board of Agriculture, Dharwar.
Mr. S. S. Yelamali, Director, Ginning and Pressing Association, Gadag, and Vice-President, Gadag Co-operative Cotton Sale Society, Ltd.
Mr. V. A. Shetty, Manager, The Gadag Co-operative Cotton Sale Society, Ltd.

5. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee is also a statutory body appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. The Sub-Committee was composed of the following members :—

Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. D. McCallum, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. W. Roberts, Mr. H. B. Moore, Mr. J. Tinker, Mr. Y. G. Deshpande and Sardar Sampuran Singh.

Messrs. H. B. Moore and D. McCallum resigned from the Sub-Committee on February 23rd and July 12th, 1932, respectively, and the question of the appointment of their successors will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee met only once during the year, the most important subject dealt with being the licensing of ginning and pressing factories.

6. *Sub-Committee on Malpractices.*—The composition of this Sub-Committee was as follows :—

Sir Joseph A. Kay (*Vice-President*), Mr. S. D. Saklatvala, Sir Purshotamdas Thakurdas, Mr. D. McCallum, Mr. Chunilal B. Mehta, Mr. T. F. Main and Rao Bahadur Bhimbhai Ranchodji Naik.

Mr. McCallum resigned from the Committee on July 12th, 1932, and the question of appointing a successor to him on the Sub-Committee will be taken up when the Sub-Committee next meets.

The Sub-Committee did not meet during the year.

7. *Agricultural Research Sub-Committee.*—This Sub-Committee meets twice every year just before the meetings of the full Committee and reports on the progress made on the schemes financed by the Committee and examines fresh proposals for new schemes. The following members were appointed at the December 1931 meeting of the Committee :—

The President, The Vice-President (Sir Joseph A. Kay), Mr. F. K. Jackson, Sardar Sampuran Singh, Mr. W. Roberts, Sir Purshotamdas Thakurdas, Mr. T. F. Main, Mr. F. J. Plymen, Mr. D. Milne, Mr. V. Ramanatha Ayyar ; Mr. B. C. Burt, Dr. L. C. Coleman, Dr. W. Burns, Mr. D. N. Mahta, Rai Saheb Ram Prasad Singh, Mr. H. H. Pandya, Mr. W. J. Jenkins, Mr. P. B. Richards, Mr. B. A. Collins, Mr. D. G. Munro and Mr. C. V. Sane (additional members) ; the successor to the Cotton Research Botanist, Lyallpur (co-opted member), and the Secretary.

Sir Joseph A. Kay, Dr. W. Burns and Messrs. W. Roberts, B. C. Burt, D. N. Mahta and W. J. Jenkins were on leave out of India during the July meeting and the vacancy caused by the resignation of Mr. D. G. Munro remained unfilled. Messrs. S. V. Ramamurty and Roger Thomas, Dr. W. McRae and Rai Saheb Kalidas Sawhney were co-opted on the Sub-Committee at its July meeting. The successor to the Cotton Research Botanist, Lyallpur, has not yet been appointed.

The Sub-Committee met twice during the year.

8. *Technological Research Sub-Committee.*—This Sub-Committee meets during the half-yearly meetings of the Central Cotton Committee and deals with all matters connected with the Technological Laboratory and Technological Research. The Sub-Committee appointed in December 1931 consisted of the following members :—

The President, Sir Joseph A. Kay (*Vice-President*), Mr. S. D. Saklatvala, Mr. B. C. Burt, Mr. D. Milne, Mr. T. F. Main, Mr. Chunilal B. Mehta, Mr. Y. G. Deshpande, Sheth Naranlal Jivanlal and the following co-opted members :—

Sir Munmohandas Ramji .. } Representatives of Bombay Mill-
Mr. F. Stones .. .. } owners' Association.

Sir Chinubhai Madhowlal .. } Representatives of Ahmedabad
Seth Chamanlal G. Parekh .. } Millowners' Association.

Mr. Bhaidas Nanalal .. } Representatives of East India
Mr. R. G. Saraiya .. .. } Cotton Association.

During the year Seth Kasturbhai Lalbhai took the place of Sir Chinubhai Madhowlal. Dr. W. McRae and Sir Purshotamdas Thakurdas were co-opted on the Sub-Committee at its July meeting.

9. *Research Students Selection Sub-Committee.*—The following members were appointed to form the Research Students Selection Sub-Committee :—

The President, Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. B. C. Burt, Dr. W. Burns, Mr. P. B. Richards, Mr. D. Milne, Mr. F. J. Plymen, Dr. L. C. Coleman, Mr. H. H. Pandya, Mr. T. F. Main, Mr. W. J. Jenkins, Mr. C. V. Sane, Mr. F. K. Jackson and Dr. Nazir Ahmad.

The Sub-Committee did not meet during the year as no studentships were awarded.

10. *Special Sub-Committees.*—As required by the Rules under the Indian Cotton Cess Act, a Special Sub-Committee met twice during the year to select a candidate for the post of Publicity and Propaganda Officer, the creation of which was sanctioned by the Committee.

A Special Sub-Committee consisting of Dewan Bahadur Sir T. Vijayaraghavacharya, Sir Purshotamdas Thakurdas, Rao Bahadur Bhimbhai Ranchodji Naik, Rao Bahadur M. G. Deshpande and Messrs. S. D. Saklatvala, Chunilal B. Mehta, T. F. Main, S. V. Ramamurty and Roger Thomas, was appointed by the Local Sub-Committee to draft a reply to a reference from the Indian Tariff Board in connection with its enquiry into the Cotton Textile Industry. The Sub-Committee met three days consecutively.

One more Special Sub-Committee consisting of Sir Joseph A. Kay, Mr. B. C. Burt, Mr. D. Milne and Mr. Chunilal B. Mehta was appointed by the full Committee to discuss with the representatives of the Government of the United Provinces the proposed Pink Boll-worm Extension Scheme in the United Provinces. The Sub-Committee with Mr. W. Roberts as an additional member met the Minister for Education and Agriculture at Lucknow on the 18th February 1932.

11. Most of the detailed work is carried on by means of these Sub-Committees which are composed mainly of the Bombay members, and the full Committee is thereby saved considerable time at its half-yearly meetings. The members of the Sub-Committees, particularly the Bombay members, have, as usual, spared no time in the Committee's work and the success which the Committee has achieved is largely due to their whole-hearted efforts.

(*a*) Mr. S. D. Saklatvala resigned his appointment as representative of the Indian Central Cotton Committee on the Imperial Council of Agricultural Research and Rao Bahadur Bhimbhai Ranchodji Naik was appointed in his place.

(*b*) During the year the East India Cotton Association amended Article 51 of the Articles of its Association relating to the constitution of its Board.

Under the amended Article the Committee is authorised to nominate two of its members from among its growers' representatives, and Rao Bahadur Bhimbhai Ranchodji Naik and Mr. M. P. Kolhe were appointed as members for 1932-33.

(*c*) At the request of the Scientific Advisory Board of the Indian Lac Cess Committee, the Indian Central Cotton Committee agreed to the appointment of Dr. Nazir Ahmad, Director, Technological Laboratory, as a member of the Board.

(*d*) In response to a request from the Imperial Council of Agricultural Research, the Committee approved of the appointment of Dr. Nazir Ahmad as a member of its Research Council and of its Advisory Board.

MEETINGS.

12. The Indian Central Cotton Committee held two meetings during the year on the 14th and 15th December 1931 and on the 1st and 2nd August 1932. Mr. G. Boyagis of Messrs. Langley & Co., Bombay, and Mr. Haridas Madhavdas, Acting President of the East India Cotton Association, attended the December meeting as visitors.

13. The Committee discussed the subject of the " Discretionary use of Committee papers and Minutes of meetings by members of the Committee " and decided that Directors of Agriculture and representatives of Trade Associations might use their discretion in showing to their Local Governments and Associations those papers circulated for meetings and portions of the Minutes in which they are interested, but on no account should any matter from them be published or given to the Press.

A list of the important resolutions passed at these two meetings will be found in *Appendix I.*

STAFF.

14. Mr. J. H. Ritchie held charge of the office of Secretary till June 25th when he proceeded on six months' leave.

Mr. P. H. Rama Reddi continued as Deputy Secretary till the date of Mr. Ritchie's departure on leave when he was appointed to officiate as Secretary.

The appointment of Deputy Secretary remained vacant from June 26th.

Mr. R. D. Mihra was appointed as Publicity and Propaganda Officer with effect from June 1st, 1932.

Dr. Nazir Ahmad held the post of Director, Technological Laboratory, during the year.

Mr. R. P. Richardson, Spinning Master at the Technological Laboratory, was on leave for one month and 25 days and Mr. D. F. Kapadia, Assistant Technologist, acted for him.

Mr. Mohammad Afzal, Senior Assistant in the Punjab Botanical Scheme, continued to hold charge of the duties of Cotton Research Botanist during the year.

PROVINCIAL AND LOCAL COTTON COMMITTEES.

15. Provincial and Local Cotton Committees met as follows during the year :—

Central Provinces Provincial Cotton Committee ..	Twice.
Punjab Provincial Cotton Committee	Once.
Madras Local Cotton Committees..	Five times.
Sind Cotton Committee	Once.

The Karnatak Board of Agriculture discussed matters concerning cotton at two of its meetings and the Gujerat Divisional Board of Agriculture at one of its meetings. The United Provinces Provincial Cotton Committee has temporarily ceased to function while the Burma Provincial Cotton Committee has been abolished.

At its meeting held in August 1932, the Committee passed the following resolution :—

> " The Indian Central Cotton Committee has read with great interest the proceedings of the Central Provinces, Sind and Punjab Cotton Committees and trusts that the good work that is being done by these bodies will be of permanent value to the cotton industry of the provinces concerned."

The Committee also decided at the same meeting to bring to the notice of Local Governments the desirability of members of the Indian Central Cotton Committee being appointed to Provincial Cotton Committees in their respective provinces.

CHAPTER II.

FEATURES OF THE YEAR.

A. Season.

16. The year under report has been abnormal in several respects. The area under cotton fell from 23,812,000 acres in the previous year to 23,522,000 acres in the year under report, which is the lowest area recorded since 1922-23, but heavier still was the decline in yield chiefly due to the failure of the Oomras and Bengal-Sind cottons owing to untimely or excessive rainfall. The total estimated yield for the season was 4,064,000 bales of 400 lbs. as compared with 5,224,000 bales for the preceding season. The average yield per acre was as low as 69 lbs., a figure lower by 12 lbs. than the lowest on record during the past one decade.

The returns of cotton pressed during the season 1931-32 show that 2,408,551 bales were pressed in British India and 903,991 bales in Indian States, making a total of 3,312,542 bales for the whole of India as compared with 4,914,297 bales pressed during 1930-31. The quantity of loose cotton received by the mills during the season amounted to 210,000 bales of 400 lbs. as against 148,700 bales of the previous season. The total crop of the season thus accounted for by the press returns and loose cotton received at the mills was only 3,522,542 bales.

The abnormal conditions which prevailed during the year under review kept up the prices of Indian cotton above parity with American cotton with the result that the export demand for Indian cotton fell off and imports of American cotton into India considerably increased. For this reason and also due to the low yield, the world's total consumption of Indian cotton fell from 5,863,000 bales in 1930-31 to 4,789,000 bales in 1931-32. The quantity of Indian cotton consumed by the Indian mills went up, however, to 2,345,078 bales of 400 lbs. (vide *Appendix IV*), an increase of 75,719 bales over the previous season's consumption. The appendix also shows the rapid expansion that is taking place in the Madras Presidency, United Provinces, Delhi and in the Indian States as consuming centres for Indian cotton.

Exports of Indian cotton during the year under review fell to 1,582,000 bales of 400 lbs. from 3,729,000 bales in 1930-31 and 3,998,000 bales in 1924-25, the previous record season. The low yield of cotton was off-set by the fall in export demand and there was therefore little change in the stocks of unsold Indian cotton in Bombay on the last day of the season.

The table below, compiled from the East India Cotton Association's returns, gives the comparative figures of stocks for the last five seasons :—

Descriptions.	31st August 1932.	31st August 1931.	31st August 1930.	31st August 1929.	31st August 1928.
Broach	63,043	38,577	31,012	15,053	17,242
Dholleras	49,300	57,559	37,354	40,291	60,336
Oomra	77,874	145,767	239,565	258,790	263,443
Khandesh	52,134	43,244	43,988	57,103	70,238
Bengals	46,272	38,800	28,276	63,121	50,988
Punjab-American	16,279	3,009	775	7,471	13,085
Dharwar	1,657	660	1,951	5,091	4,870
Comptas, Tinnevelleys and Cambodia	29,525	37,416	16,785	29,249	44,346
Westerns and Northerns ..	31,130	22,466	9,048	25,486	27,404
Persian	500	..	..	31	190
Americans	16,456	11,838	297	333	2,034
Egyptians	20,082	2,021	..	..	..
East Africans	21,975	32,645	12,293	13,592	9,150
Other sorts	4,836	10,879	10,628	26,363	37,635
Total ..	431,063	444,881	431,972	541,974	600,961

It is seen that the total stocks of unsold cotton on the 31st August 1932 were very nearly the same as on the 31st August 1930 and that there was a very great reduction in the stocks of Oomras.

B. Work of the Year.

17. The year under review witnessed the completion of four of the Committee's research schemes, three of them being those that were originally sanctioned in 1923. There were 29 research and other schemes under operation during the year 1931-32 at a cost of Rs. 4,93,840 and their progress has been reviewed in the subsequent chapters of this report. In this chapter are given the stages of development reached in the various legislative and other measures in the introduction of which the Committee has played no mean part in its advisory capacity. Also some of the other important features of the Committee's activities which have not been included in the above categories are briefly touched upon in the following paragraphs.

Reference was made in last year's report to the review of the Committee's work and its research policy. The pamphlet " Cotton Improvement in India," dealing with these points, was circulated to all trade associations in India and to many individuals interested in cotton, and their views were solicited. The several interesting and helpful comments and criticisms thus received were discussed by the Committee at its twenty-fourth meeting held in December 1931, and the tentative conclusions that were arrived at will

be further considered at the next cold weather meeting. The two important questions which the Committee will be called upon to consider, in the words of the President, are :—

(1) " India is capable of growing its own present mill requirements of long-staple cotton, but will it pay the grower in every case ?

(2) If staple cotton replaces the short-staple varieties at present grown, what effect will that have on the price of the two commodities ? "

The preliminary work in connection with the proposed investigation into the cost of cultivation of cotton, sugar-cane and their rotation crops in the different parts of India, to be jointly financed by the Imperial Council of Agricultural Research and the Committee, has now been completed and the full scheme formulated by the Joint Committee of these two bodies awaits the approval of the Committee.

The Committee also dealt with certain specific points referred to it by the Tariff Board in connection with its enquiry into the Cotton Textile Industry in India. The Tariff Board's letter and the Committee's reply thereto are given in *Appendix V*. Arising out of the oral evidence tendered to the Tariff Board by the representatives of the Committee, the Committee was further called upon to examine the proposition that the grower of long-staple cotton in India was not realizing adequate price for his cotton. The results of the Committee's enquiry into this matter are contained in the letter sent to the Tariff Board (*Appendix VI*).

THE COTTON TRANSPORT ACT.

18. In 1923, the Government of India, at the request of the Central Cotton Committee, passed the Cotton Transport Act which enables Local Governments to prohibit the import of cotton into any area within their jurisdiction. This Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior strains.

19. *BOMBAY.*—There was no change during the year in the seven areas notified in the Bombay Presidency though the position in the Surat area remains still unsettled. The subject was again discussed by the Committee in December 1931 when it was decided that further action should be postponed for another two years till the two cottons, 1027 A.L.F. and 1A, were given thorough tests for yield and spinning quality.

20. No change was made in the protected areas in Baroda, Rajpipla and Chhota Udepur States.

21. *MADRAS.*—No change has taken place in the protected areas. The absence of restriction on the movements of cotton by road and river has resulted in the object of the Cotton Transport Act being partially

defeated, as *Cocanadas* cotton and cotton from the Nizam's Dominions get into the districts of Bellary and Kurnool as also Malabar and Mysore cottons are taken to Tiruppur. The Southern tract is very extensive, comprising no less than 11 districts, and has facilities to grow several varieties of cotton both inferior and superior and to carry them freely from one place to another within the protected area, so that mixing of Cambodia with any inferior cotton is an easy affair. The amalgamation of the Tiruppur and Tinnevelly areas has thus reduced the benefits of the Act.

22. *CENTRAL PROVINCES.*—The position of the protected area in the Central Provinces and Berar remained unchanged during the year.

23. *INDORE.*—The Indore Cotton Transport Act was amended during the year under review restricting the scope of the Act to only *Deshi Mewadi* cotton. This was done in view of the representation of the local mills that they could not get readily their supplies of cotton, as according to the practice in the State the mills depend upon the local markets for their requirements of cotton, the bulk of which is brought in country carts from outside the State. The amendment was considered by the Local Sub-Committee in July 1932 which decided not to take any action till more information on the subject was available. The protected area remained the same as in the previous year.

24. *HYDERABAD.*—No change has taken place in the areas protected under the Hyderabad State Cotton Cultivation and Transport Act.

25. *SANGLI.*—The position of Sangli remained the same as in the previous year.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

26. There is nothing particular to report. The Act worked smoothly and the few cases of infringement were reported to the authorities concerned.

27. Legislation for the marking of bales is now in force in the following Indian States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Bikaner, Bundi, Cambay, Chhota Udepur, Cutch, Datia, Dewas (Junior), Dhar, Dhrangadhra, Faridkot, Gondal, Holkar State (Indore), Hyderabad (The Nizam's Dominions), Idar, Jaipur, Jamkhandi, Jaora, Jasdan, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kishangarh, Kolhapur, Kotah, Lakhtar, Limbdi, Malerkotla, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Patiala, Porbandar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayla, Shahpura, Tonk, Wadhwan, Wankaner and Western India States Agency areas.

Weekly cotton press returns are sent by all the above States except :—

Sachin, Bundi, Kotah, Patiala, Dewas (Junior), Kishangarh and Malerkotla.

Gwalior has not yet introduced legislation for the marking of bales. The Committee has been informed that the subject is still under the consideration of the State authorities.

RE-USE OF OLD HOOPS.

28. The question of the re-use of old hoops was considered by the Cotton Ginning and Pressing Factories Sub-Committee and it was decided to draw the attention of all pressing factories to the prevalence of duplicate marks on hoops and to point out to them that stencilling on the hessian was permissible. All Local Governments also were addressed to bring this matter to the notice of the press owners and also to instruct them on the necessity of deleting from the hoops, when they were used more than once, all marks other than their own before the bales were allowed to leave the factory.

LICENSING OF GINNING AND PRESSING FACTORIES.

29. While discussing the subject of the future policy of the Committee at the twenty-fourth meeting of the full Committee several members dwelt on the necessity of licensing the ginning and pressing factories. The Cotton Ginning and Pressing Factories Sub-Committee took the lead of the full Committee and decided at its meeting in February 1932 to obtain the views of the trade associations represented on the Committee before any further action was taken on the subject. The views of the trade bodies have been received and the subject will be considered again.

MALPRACTICES.

30. No cases of malpractice were reported to the Committee during the year.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

31. The recommendations of the Special Sub-Committee which dealt with the reports on the investigations into the finance of the cotton crop and its marketing were forwarded to the Local Governments concerned and the further steps taken by them during the year to give effect to these recommendations are given below :—

BOMBAY.—The Bill for the standardisation of weights and measures, which was under consideration since last year, has since been passed. The details of the Bill as passed have not yet been received from the Government.

The Registrar of Co-operative Societies, Bombay, has submitted his report recommending the formation of co-operative cotton sale societies and regulated markets in Sind, but due to the present financial stringency the Government of Bombay have decided to temporarily drop the question.

MADRAS.—No further progress has been made with the Bill which was drafted last year for the establishment of regulated markets for commercial crops.

PUNJAB.—The report on the enquiry into the market practices in the Punjab has not yet been received. The question of the establishment of open regulated markets by the Punjab Government will be considered on receipt of the report.

COTTON MARKETS.

32. The year under report has witnessed still further progress in the steps taken to open regulated cotton markets in India.

The Committee, at its meeting in December 1931, considered the first report on the working of the Dhulia Cotton Market and recommended to the Bombay Government that a copy of the report should be sent to every District Local Board and Municipality interested in cotton with a view to acquainting them with the successful establishment of this market. The District Local Board, East Khandesh, has passed a resolution that the Amalner and Jalgaon markets should be brought under the Bombay Cotton Markets Act, 1927, but due to certain difficulties the resolution has not yet been given effect to and the matter is engaging the attention of the Commissioner, Central Division. The question of the establishment of a market at Bijapur is under consideration.

The Madras Presidency has made no further progress with the Bill to provide for the establishment and better regulation of markets for commercial crops.

The Central Provinces Cotton Market Bill, which was introduced in the local Legislative Council by Mr. M. P. Kolhe, a member of this Committee, who is also a member of the Central Provinces Legislative Council, was passed towards the end of August (copy of the Act is given in *Appendix VII*). The draft Bill was approved by the Committee at its December meeting.

A complaint was received from the East India Cotton Association against the high incidence of license fees levied from brokers and *adatyas* in Berar cotton markets under the revised Berar Cotton Market rules. The Committee decided that no recommendation should be made to the Central Provinces Government till the revised rules were given a fair trial. The subject is likely to come for consideration next year again.

In Hyderabad State, the Hyderabad Agricultural Markets Act has been applied to the Jalna, Umri, Latur and Sailu markets in addition to the Nanded market.

The rules for the regulation of cotton marketing in Indore City, which came into force in November 1929, were revised during the year and the revised rules were published in the *Holkar Sirkar Gazette* on 7th March 1932. The important change relates to the increase of the size of the Market Committee with a larger representation to the grower on it.

The Karachi Joint Cotton Committee referred to the Indian Central Cotton Committee for its opinion a proposal to alter the standard for Punjab-American cotton from 6/8″ *minimum* to 6/8″ *average*. The Local Sub-Committee voted against the change and the Karachi Joint Cotton Committee has agreed to retain the old standard of 6/8″ *minimum*.

The question of the adoption of universal standards for Indian cotton was again discussed by the Committee at its monsoon meeting. It was decided to ascertain the views of commercial bodies and agricultural associations and to consider the whole question again at the next cold weather meeting.

POOLS OF COTTON GINNING AND PRESSING FACTORIES.

33. It was mentioned in last year's report that the Governments of Bombay, the Central Provinces and Ajmer-Merwara were carrying on investigations, at the cost of the Committee, into the effects of " pools " of cotton ginning and pressing factories on the rates paid to the grower for his cotton. The reports on the investigations were received from the three Governments and it is seen from them that the rates charged by " pools " for ginning and pressing were distinctly higher than in places where " pools " did not exist. The Committee therefore decided to draw the attention of the Governments concerned to the reports of these investigations and to request them to take any action which they thought necessary to prevent the grower being penalised by " pools."

MADRAS COTTON CONTROL ACT.

34. As stated in last year's report, the Local Sub-Committee made a recommendation to the Madras Government that some of the penalties in the Madras Cotton Control Bill were too severe and that they might be lightened. The full Committee further considered the draft Bill in its December meeting and made a suggestion to the Government that the scope of the Bill might be restricted to *Pulichai* cotton in the Tinnevelly area. The recommendations of both the Local Sub-Committee and the full Committee were accepted except that the area was not limited to the Tinnevelly tract only. The Act received the assent of the Governor-General in June 1932. A copy of the Act and Notifications and Rules issued thereunder will be found in *Appendix VIII*.

THE BOMBAY COTTON CONTRACTS BILL.*

35. The Committee was asked by the Bombay Government to express its views on the new Cotton Contracts Bill which was intended to take the place of the Cotton Contracts Act of 1922. The Bill provided necessary safeguards for free trading in the Bombay Cotton market from outside interference and was intended to help partly a large number of traders and dealers in Bombay who were anxious to carry on their business in the normal way, and particularly the cotton growers throughout India to obtain the best possible prices for their cotton. After full discussion the Committee recommended that, except under abnormal conditions when the Government should have the option to recognize more than one association, there should ordinarily be only one association and that the clauses relating to the supersession of the Board of Directors by a Board of Control were unnecessary.

PUBLICITY AND PROPAGANDA.

36. The question of giving wide publicity to its work and carrying on propaganda on its behalf has been engaging for some time past the attention of the Committee which at its December meeting decided to create a whole-time appointment of Publicity and Propaganda Officer. Mr. R. D. Mihra, M.A. Agri. (Oxon.), Post-Grad. Dip. Agri. (Oxon.), B.Litt. Rural Econ. (Oxon.), was selected to fill the post, and he joined duty on the 1st June 1932. He devoted much of his attention during the three months from 1st June to the end of August to the study of the Committee's schemes, and issued in addition *communiques* on the following research schemes :—

1. Punjab Botanical Research Scheme.
2. Punjab Entomological Research Scheme.
3. Gujerat Boll-worm Research Scheme.
4. Gujerat Boll-worm Clean-up Scheme.
5. United Provinces Pink Boll-worm Research Scheme.
6. Sind Physiological Research Scheme.

Besides, a Press *communique* embodying the work of the August meeting of the Committee was issued and given wide publicity. Furthermore, a number of Press *communiques*, posters, illustrated bulletins, etc., *have* been prepared **which, when** approved by specialists, will be issued in due course.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

37. *THE MEXICAN BOLL-WEEVIL (Anthonomus Grandis).*— With a view to prevent the introduction into India, through imported American cotton, of the most serious of all cotton pests, viz., the Mexican

* Since passed into law.

Cotton Boll-Weevil, the Government of India, at the instance of the Indian Central Cotton Committee, has restricted, since 1925, the import of American cotton to a single port, namely Bombay, and only after fumigation with hydrocyanic acid gas. During the year under review 244,695 bales were fumigated at Bombay as against 128,845 bales during the previous year. It is gratifying to be able to record that the rebate of fumigation fees at the rate of 8 annas per bale, referred to in last year's report as having been recommended by the Committee, has since been sanctioned by the Government of India and disbursed to the importers concerned. The Committee has now recommended a rebate of 11 annas per square bale and 7 annas per round bale on all cotton fumigated between the 1st April 1931 and the 31st March 1932. The Government of India issued, in October 1931, a comprehensive notification embodying all the live portions of their previous notifications on the subject of fumigation of American cotton at Bombay (*vide* Government of India Notification No. 1581-Agri., dated the 1st October 1931, in the Department of Education, Health and Lands).

38. *The Red (Sudan) Boll-Worm (Diparopsis Castanea) and other pests.*—The restrictions placed on the import of foreign cotton seed under the Government of India Notification No. 1213-Agri., dated the 27th May 1930, in the Department of Education, Health and Lands, and the entire prohibition of the import of foreign *kapas* (unginned cotton) under the Government of India Notification No. 897-Agri., dated the 24th July 1925, in the Department of Education, Health and Lands, continued in force throughout the year. At its twenty-fifth meeting, the Committee again discussed the present restrictions on the import of foreign cotton seed, and decided that no steps need be taken to raise the permissible maximum quantity of seed, viz. 1 cwt., that could be imported in one consignment.

COTTON STATISTICS.

39. *Cotton forecasts.*—The arrangement introduced in 1930 under which the forecast figures are telegraphed by the Director-General of Commercial Intelligence and Statistics, Calcutta, to the Secretary, Indian Central Cotton Committee, in time to enable the latter to post the figures at the offices of the East India Cotton Association, Bombay, simultaneously with the release of these figures at Calcutta, continued to work in the year under report. The cotton trade of Bombay greatly appreciate this arrangement.

It has all along been the earnest desire of the Committee to explore all avenues which would lead to the improvement of the accuracy of the cotton forecasts compiled and published by Government. The efforts made in the past by the Committee, in close co-operation with the Government Agency responsible for the compilation of forecasts, have brought to light several sources of error in the forecasts. And yet the general impression among the trade, and the compilers of private crop estimates, is that the Government forecasts are unreliable. The Committee, at its twenty-fifth meeting, further

considered the subject, and referred it to the Local Sub-Committee to prepare a reasoned memorandum for consideration at the next meeting.

40. *Raw cotton trade statistics.*—Reference was made in last year's report to the recommendation made by the Committee to the Government of India urging the separation of Kathiawar from the Gujerat trade block in the classification of trade blocks adopted for the purposes of raw cotton trade statistics. This recommendation has since been accepted by the Government of India, and Kathiawar is now being separately shown in these statistics.

The ginned cotton of any particular block goes partly to the pressing factories for pressing into bales and partly into the mills direct for consumption. A part of it is also exported loose and the rest is consumed for domestic purpose. Figures of cotton pressed into bales and loose cotton received in the mills are now available. If, in addition, information regarding net imports and exports of loose cotton also is known, the authorities concerned with the preparation of statistics will be in a position to estimate more accurately the yield of cotton than at present. The Committee has therefore recommended to the Government of India that separate statistics for all loose cotton, exported or imported, should be made available for all such trade blocks as, in the opinion of the Provincial authorities responsible for the compilation of cotton forecasts, are of importance for their purposes.

41. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for Indian mills of American cotton, the arrivals and the quantity at sea. Importers and millowners of Bombay again furnished information confidentially regarding their purchases of American cotton, and the Committee once again wishes to record its thanks to them for their valued co-operation.

42. *Demand for various types of Indian cotton.*—Reference has been made elsewhere in this report to the review of the Committee's work and research policy initiated during last year. The Committee while discussing the subject thought it necessary first to obtain sufficient information on the export and mill demand for all types of Indian cotton and the variation, if any, in their demand before any definite policy was laid down. Accordingly in January 1932, all mills and exporters in India were addressed to furnish confidentially information regarding the various types of Indian cotton exported or received in the mills during the seasons 1928-29 to 1930-31. Information is being collected for 1931-32. The Committee greatly appreciates the ready response and the valued co-operation it has received in this enquiry from the millowners and exporters. The export figures thus collected came in very handy to solve a knotty problem presented by the Tariff Board (vide *Appendix VI*).

43. *Cotton consumption.*—The compilation and publication of the monthly statements* (1) of Indian cotton consumed in British Indian mills,

*Appendix IV.

(2) of Indian cotton consumed in mills in Indian States, (3) of loose cotton received in the mills in the major cotton growing provinces, and (4) a consolidated statement of (1) and (2), specially meant for publication in the daily Press, was continued. The usefulness of these figures has been greatly enhanced by the arrangement made with Local Governments in which District Collectors supply the Committee with the monthly cotton consumption statements on or before the tenth day of the succeeding month, thus enabling the Committee to publish the all-India figures a month earlier than before. The Committee's thanks are also due to the Indian States concerned for their co-operation in this matter.

COLLECTION AND SUPPLY OF INFORMATION.

44. As in past years, notes* on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee, were contributed to the Bombay Cotton Annual, published by the East India Cotton Association.

45. The system introduced in March 1929 of circulating the more scientific and technical journals between the cotton research institutions financed by the Committee worked satisfactorily during the year. This system prevents the unnecessary duplication of literature purchased out of the Committee's funds, and also affords an opportunity to *mofussil* research workers to peruse literature of a more scientific nature than they normally would.

46. The Committee has again to record its thanks to those private and public institutions which maintain on their free mailing list the name of the Committee. The Committee is particularly indebted to the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, to the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to members.

PUBLICATIONS.

47. The following bulletins and reports were published during the year :—

(1) Application of different systems of Highdraft spinning to mixings of Indian Cottons (Technological Bulletin A19).

(2) Spinning Tests on mixings of long-staple and short-staple Indian Cottons (Technological Bulletin A20).

(3) Technological Report on Standard Indian Cottons, 1932 (Technological Bulletin A21).

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* Appendix IX.

(4) Spinning Test Report on samples of Kadi/Viramgam and Tinnevelly Cotton, 1930-31 (Technological Circular No. 59).

(5) Spinning Test Reports on 1931-32 samples of :—

(*a*) Dhulia (Khandesh) Cotton (Technological Circular No. 60).

(*b*) Ujjain Cottons (Technological Circular No. 63).

(*c*) Khandesh Cottons (Technological Circular No. 64).

(*d*) Broach (Salar), Bailhongal and Hubli-Kumpta Cottons (Technological Circular No. 69).

(*e*) Jagadia and Kadi Cottons (Technological Circular No. 70).

(*f*) Hubli-Kumpta and Hubli-Upland Cottons (Technological Circular No. 71).

(*g*) C. P. No. 1, Muttia and Berar Cottons (Technologica Circular No. 72).

(*h*) Latur and Nanded Cottons (Technological Circular No. 73).

(*i*) Surat and Broach Cottons (Technological Circular No. 74).

(*j*) Punjab-American, Jagadia Farm and Navsari Cottons (Technological Circular No. 75).

(*k*) Dhollera, Westerns and Kumpta Cottons (Technological Circular No. 76).

(*l*) Bijapur and Tinnevelly Cottons (Technological Circular No. 77).

(*m*) Upland, Cambodia and Karunganni Cottons (Technological Circular No. 78).

(*n*) Kadi/Viramgam and Khandesh Cottons (Technological Circular No. 79).

(*o*) Kalagin and Bagalkote Cottons (Technological Circular No. 80).

(6) Technological Reports on 1931-32 samples of :—

(*a*) Umri Bani (Technological Circular No. 61).

(*b*) Verum 262 (Akola) (Technological Circular No. 62).

(*c*) Verum 262 (Nagpur) (Technological Circular No. 65).

(*d*) Punjab-American 289-F (Technological Circular No. 66).

(*e*) Punjab-American 4-F (Technological Circular No. 67).

(*f*) Jayawant (Kumpta) (Technological Circular No. 68).

SECRETARY'S TOURS.

48. The Secretary visited, during the year, the following places in connection with the Committee's work :—

Simla (twice), Calcutta, Cawnpore (twice), Nagpur (twice), Akola, Secunderabad, Parbhani, Nasik, Baroda, Indore, Lucknow and Poona.

FINANCIAL.

49. In *Appendix X* will be found a statement showing the Receipts and Expenditure and also the Balance Sheet for the year ending March 31st, 1932. Receipts amounted to Rs. 7,38,805 and expenditure to Rs. 7,99,873 against an estimated expenditure of Rs. 11,00,650. The principal items of saving were under Seed Distribution and Extension Schemes (Rs. 73,353)—several schemes sanctioned were held in abeyance; Technological Research (Rs. 53,063); Research Studentships (Rs. 30,676); Co-ordination of Cotton Research in Bombay (Rs. 19,731); other Bombay Schemes (Rs. 13,639); Madras Pempheres and Physiological Scheme (Rs. 9,415); Punjab Schemes (Rs. 16,103); Central Provinces Scheme (Rs. 13,648) and the Institute of Plant Industry, Indore (Rs. 30,000). In the current year receipts are estimated at Rs. 6,53,500 and expenditure at Rs. 10,52,594. With the new schemes sanctioned during the year the Committee will again be compelled to draw on its savings.

CHAPTER III.

RESEARCH.

50. WITH the passing of the Cotton Cess Act, the Indian Central Cotton Committee was provided with funds which are employed in two ways for the improvement and development of the growing, marketing and manufacture of cotton in India. In the first place, the Committee itself directs the work of the Technological Laboratory at Matunga, Bombay, and secondly, it subsidizes the Departments of Agriculture in Provinces and Indian States for the investigation of specific problems and the extension and distribution of seeds of improved varieties of cotton. In addition, a large sum of money is contributed annually to the Institute of Plant Industry, Indore, which is a Central Research Station for cotton and other agricultural problems.

Under the heading of specific problems are included several schemes of research—botanical, for the purpose of obtaining improved strains of cotton by selection and hybridisation; physiological, for investigation into the causes of shedding of buds, flowers and bolls; entomological, for the study of life-history of certain pests and methods of combating them, and mycological, for finding ways of overcoming the loss by *wilt*, etc.

The next important activity of the Committee in the provinces is the extension of improved varieties of cotton which have already been evolved by the Provincial Agricultural Departments and to bring to the notice of growers the results of the Committee's schemes, which have proved successful. It will be realized that this latter phase of the Committee's activities is of considerable importance and it grows in value every year as the schemes now in progress bear fruit.

A modest beginning was made last year in propaganda work in the Surat area to prevent the carry-over of the *Spotted Boll-worm* and during the year under report a special officer was appointed to carry on publicity and propaganda of the Committee's work.

The Local Governments were likewise provided with funds for conducting enquiries into the finance and marketing of cultivators' cotton in primary markets and also for investigating in three provinces into the effect of pools of cotton ginning and pressing factories on prices paid to the growers for their cotton.

The Committee also undertakes the training of workers for the different branches of its activities, and since 1923 no fewer than 38 men have received training in various branches of work with which the Committee is concerned.

TECHNOLOGICAL LABORATORY.

51. The report of the Director, Technological Laboratory, for the year under review will be found in Chapter V of this report. As will be seen, the work of the Laboratory during the year maintained the high level reached in the previous year. The number of lots and samples spun during the year was about the same as last year, and with the present staff and equipment this number appears to represent the maximum which can be tackled by the Laboratory in the course of a year. There was a small decrease in the number of yarns spun but this was due to cutting down the number of counts into which a cotton is spun to a minimum with a view to testing as many samples as possible in a year. The different samples tested fall under four heads : (1) Agricultural samples, (2) Standard Indian cottons, (3) Trade samples, and (4) Technological samples. The agricultural samples consist of the promising strains of new cottons which are being evolved at the different Agricultural Research Stations and comprise the bulk of all samples tested during the year amounting to 53 per cent. as against 65 per cent. of the last year. The decrease was due to late arrivals of samples, the season being late, particularly in the Punjab, Bombay and Berar. The standard Indian cottons are mostly the improved varieties which are introduced by the several Agricultural Departments, and occupy 15 per cent. of the total area sown to all kinds of cotton in India. Eighteen standard cottons were tested during the year and the results of those cottons that were received early in the season were published in the " Technological Reports on Standard Cottons, 1932." Testing of the trade samples was started in 1929-30 in response to the demand that the Laboratory should be made directly useful to the trade also. Twenty-three samples selected by the Standards Committee of the East India Cotton Association, representing the average commercial crop of the year, and 13 samples supplied by mills through the Millowners' Associations of Bombay and Ahmedabad were tested and the results published in two-page Technological Circulars. The results of these tests when available for a number of years will give useful and reliable information as regards improvement or deterioration of any of the varieties tested. The Committee considered the demand from individual mills for testing ordinary mill samples and decided that such samples which have no technological significance should be tested only on payment of Rs. 50 for a full test, Rs. 25 for a fibre and blow-room test and Rs. 15 for a fibre or yarn test of each sample. The technological samples are tested in connection with the technological research on the spinning properties of cottons and their mixings.

The special tests were continued on *Banilla* cotton, the spinning quality of which has deteriorated since it was first introduced in Khandesh by the Agricultural Department, and the results have been embodied in a report which will soon be published.* A number of tests were also carried out for finding out the effects of green stain on *Sind-American*. The green stain appears to be due to the separation in ginning of the green fuzz from

* Since published (Technological Report on *Banilla* Cotton, 1930-32).

the seed. Most of the stain was removed in the form of impurities by the normal treatment in the blow-room and the card-room. The yarns spun from this cotton were slightly greenish. Their strength, however, remained almost unaffected and also the green tint disappeared after bleaching by an ordinary mill process. The spinning tests on mixings of long and short staple cottons, 4*F* and 289*F*, 4*F* and *Mollisoni* and *Karunganni* and *Pulichai* were continued, and the results reveal the extent of harm done to good quality cottons by adulterating them with inferior types. The tests on cotton grown with different waterings, other agricultural operations being the same, show that when the number of irrigations was reduced the length and strength of fibre were adversely affected, and that when the crop was given additional waterings even late in the season these defects were remedied.

Mention was made in last year's report of the tests carried out for finding out the normal moisture content of bales pressed under known conditions of temperature and humidity without extra humidification. The experiment was continued during the year under review on ordinary commercial bales as they were received in Bombay. In view, however, of the importance of these tests to the trade and also of the very interesting results obtained, the experiment on trade bales will be continued for one more year.

INDORE INSTITUTE OF PLANT INDUSTRY.

52. The Annual Report of the Director, Institute of Plant Industry, Indore, for the year 1931-32, is found in *Appendix II*. In 1923 the Committee decided to contribute to the proposed Plant Breeding Institute at Indore which would in return devote itself principally to the investigation of cotton problems, and the Institute was opened in 1924 as a Central Research Institute for cotton. Indore is well suited for investigations of cotton problems, situated as it is in an extensive cotton tract. The cottons of Malwa plateau were at one time well known for their excellent quality but to a large extent they have now been replaced by high-yielding short-staple cottons. The main object of the Institute is therefore to provide a centre of cotton research for the black soil tract of Central India. The programme of work laid down includes the general botany, physiology and genetics of Indian cottons in addition to agricultural investigations connected with cotton cultivation in Central India. Considerable progress has been made in the direction of agronomy, and the cumulative effect of grading, surface drainage, clean cultivation and the application of compost has trebled the yield of cotton on the Institute farm. The methods employed are by no means very expensive and no costly manures are required. The process of converting the waste products into valuable compost, as introduced by Mr. Howard, entails no expenditure beyond manual labour and is therefore well within an easy means of the cultivator to double his manure supply every year. Attempts are now being made to carry these improvements to the contributing States. Selection work has now reached the

stage of comparative trials and it is hoped that Malwa will have an improved strain of cotton within the next two or three years. The botanical survey of cottons grown in India was continued and the study of the root system of the varieties on hand was completed during the year. A number of X-Ray exposures were made on cotton seed, buds, and pollen with a view to induce mutations and the effect of these exposures will be studied on subsequent generations. On the physiological side much work has been done on the relationship and reaction of the cotton plant to its environment in the black soils. A number of prospective agricultural employees were given practical training at the Institute in different subjects for periods varying from one to nine months and a special course of training was arranged for Revenue officials.

The cotton research policy* of the Institute came for special review during the year and it was decided that the Institute should hereafter devote greater attention than hitherto to cotton research.

GRANTS-IN-AID.

53. The Committee carries out its policy of cotton research and seed extension by providing the Provincial Agricultural Departments and the Indian States with necessary funds for extra staff and equipment for investigation of the approved problems. All schemes are first considered and approved by the Agricultural Research Sub-Committee before being sanctioned by the full Committee. The Committee is kept in close touch with the development of work by means of the progress reports submitted every year by the officers in charge of the schemes. In view of the increasing demand for funds for new schemes, the Committee decided, at its August meeting, that all new schemes should first be closely scrutinized by small Sub-Committees before they are referred to the Agricultural Research Sub-Committee for approval.

During the year under review the Committee provided funds for 22 research schemes and also sanctioned three more new schemes which have not yet started work.

The existing research schemes are as follows :—

Madras	3—1 Botanical, 1 Physiological and 1 Entomological and Physiological.
Bombay	6—3 Botanical, 1 Physiological, 1 Entomological (Propaganda) and 1 Mycological.
Sind	1—Physiological.
Central Provinces ..	1—Botanical.

* Appendix III.

United Provinces	..	1—Entomological.
Punjab	..	3—1 Botanical and Physiological and 2 Entomological.
Hyderabad	..	2—1 Botanical and 1 Cotton Survey.
Indore	..	1—Botanical and General.
Bikaner	..	1—Botanical.
Burma	..	1—Agronomic.
Baroda	..	2—1 Root-Rot and 1 Comparative Tests between 1027 *A.L.F.* and 1*A* cottons.

The three new schemes for which funds have been allotted and which have not yet started are :—

Bombay	..	1—Co-ordination of Cotton Research.
Punjab	..	2—1 Root-Rot and 1 Spraying against White Fly.

During the year under review the Khandesh Cotton Breeding Scheme in the Bombay Presidency was closed down after the sanctioned period. Three other schemes, viz., Surat Physiological, Dharwar Wilt and United Provinces Entomological Schemes, have also completed their respective terms, except that the writing up of their final results has not yet been finished.

SCHEMES IN PROGRESS.

Madras Presidency.

54. *The Madras Herbaceum Scheme* commenced work in 1923. It was extended for two years in 1928 and again for five years from July 1930. The original object of the scheme was to obtain by selection suitable strains from local *Uppam* (*G. herbaceum*) equal to *Karunganni* (*G. indicum*) in yield and spinning quality when grown under similar conditions in black soil tracts of Salem and Coimbatore districts of the Madras Presidency. The rainfall of these districts is precarious, and in years of good rainfall *Karunganni* gives a much higher yield than *Uppam*, while in years of low rainfall the position is reversed, the latter being much the hardier of the two. The cultivator meets the situation by sowing a mixture of the two cottons. The *Karunganni* strains which are being distributed by the Agricultural Department are capable of being spun into 26's standard warp counts, and when it was discovered that none of the *Uppam* strains was ever likely to reach the level of *Karunganni* by pure selection, the Committee sanctioned, in 1930, the extension of the scheme for a further period of five years for obtaining by hybridisation what unit selections failed to achieve. Out of the several selections that were made in 1930-31 from the *F*2 generation

of a promising cross which was made in the early phase of the scheme between *Indicum* and *Cernuum* and crossed again with an *Uppam* strain, 16 were found as good yielders as *Karunganni C7* in strip tests and they will all be examined for purity in economic characters. A large number of plants of high yielding quality were also selected for further tests from *F2* generation of *Herbaceum* and *Indicum* crosses and *F3* generation of *Indicum*, *Cernuum* and *Herbaceum* crosses. The attempt made to induce mutations by X-Ray treatment did not give satisfactory results but the material obtained would be put to further tests.

55. *Fodder Cholam Scheme.*—This scheme was sanctioned for three years in July 1930 and commenced work in January 1931. It aims at an investigation into the harmful effects of fodder *Cholam* (*Andropogon sorghum*) when compared with *Cumbu* (*Pennisetum typhoideum*) on the succeeding cotton crop, and the problem is being attacked from the points of soil moisture, soil nitrogen, distribution of *Cholam* and *Cumbu* roots in the soil and the rate of their decomposition. The results obtained during the year are summarised below :—

1. The low yield of cotton in " after-*Cholam* " plots is not due to deficiency of moisture in the soil.

2. There was no difference in yield of cotton when *Cholam* and *Cumbu* were cut for fodder in milk stage. The low yield of cotton after *Cholam* may therefore be due to the ordinary practice of allowing *Cholam* to run into seed.

3. The quantity of nitric nitrogen available in *Cholam* plots, whether cut for fodder or allowed to set seed, was less than in *Cumbu* plots though the total quantity of nitrogen was the same in *Cholam* and *Cumbu* plots.

4. *Cholam* plant produces more weight of roots per unit volume of soil than *Cumbu* plant. *Cholam* roots contain more sugar and decompose less readily than *Cumbu* roots.

56. *The Pempheres and Physiological Scheme* was first sanctioned in 1925 but owing to the difficulty of securing a Physiological Botanist with requisite qualifications and experience it had to be delayed till 1931. The Committee at its meeting in July 1930 finally approved of the revised proposals submitted by the Director of Agriculture, Madras, and, pending the return of the two officers of the Madras Agricultural Department who have been sent to England for training and who will take over charge of the scheme, the preliminary investigations are being carried out under the general supervision of the Cotton Specialist, Coimbatore. The scheme comprises two parts, viz., entomological and physiological. The Entomological part consists of an investigation into the methods of fighting out the Cotton Stem Borer (*Pempheres affinis*), an important pest in the Madras Presidency, while the Physiological part aims at ascertaining the causes

for greater damage by the borer on some cottons than on others. The work of the year throws some light on the relation between the insect and the cotton plant.

Bombay Presidency.

57. *Surat Physiological Scheme.*—This scheme was sanctioned in 1923 and was extended in 1928 for a further period of five years subject to review at the end of three years. The scheme came for consideration in July 1931 when it was decided that it should be closed down at the end of the cotton season 1931-32 and that the year 1932-33 should be devoted to the writing up of the results. The work of the year under report is mainly a repetition of what was done in the previous year and confirms the results already obtained. The important results are summarised below :—

1. The heavy shedding of buds, flowers and bolls is due to the interaction of growth activities and inadequacy of food supply, particularly nitrogen, in the plant.

2. The marked fall of nitrogen in the plant occurs at about the period of the commencement of the usual heavy boll shedding and it remains at that level thereafter till the season is over.

3. The early application of nitrogen in a readily available form increases the vegetative growth and production and retention of buds.

4. The late application of nitrogen causes a larger proportion of flowers to ripen into bolls.

5. The application of nitrogen is not of much consequence under rain-fed conditions except in years of late rains but it is of high economic value when irrigation is possible.

6. Boll shedding is to some extent hereditary.

58. *Surat Boll-worm Propaganda Scheme.*—This scheme is the result of the Surat Entomological Scheme which came to a successful termination in March 1931. The object of the latter scheme was to study the life-histories of the *Spotted Boll-worms* (*Earias fabia* and *insulana*) and to devise means for reducing the loss caused by them. The investigations provided a large amount of useful information, and before the scheme was actually closed down the Committee, with a view to give practical application to the findings of this scheme, sanctioned a new scheme in December 1930 for intensive cleaning up in a selected area of 480 square miles in Gujerat, immediately after harvest, of all cotton stalks and stubbles and for eradication of alternative host plants. The Clean-up Scheme could not, however, be started immediately, due to unfavourable political situation in Gujerat and also due to comparative ignorance of the cultivator of the activities of

the Department of Agriculture in the area where the campaign was to be undertaken. The Committee, therefore, thought it desirable to start propaganda for the purpose of establishing good relations between the Department of Agriculture and the cultivator, and sanctioned the Boll-worm Propaganda Scheme as distinct from the Clean-up Scheme already sanctioned. An intensive propaganda was carried on from April 1931 to the end of January 1932 by means of occular demonstrations and discussions to convince the cultivator that a substantial increase in yield of *kapas* could be obtained by depriving the boll-worm of its food supply. These measures were very successful and when the Propaganda Scheme merged in February 1932 into the Clean-up Scheme the growers readily purchased as many as 6,815 plant pullers with which 60,000 acres out of a total area of 80,000 acres were dealt with. The remaining area was cleaned by local method and this might give rise to the ratoons being sprouted and the boll-worm being carried over. The results will be seen in the next season.

59. *The Dharwar Wilt Scheme* was started in 1923 for finding out means of checking the spread of *wilt* disease on local cottons in the Gadag area. On failure of this object, the Committee decided, in 1928, that breeding of wilt-resistant strains was the most satisfactory way of overcoming the disease and sanctioned the extension of the scheme for a further period of five years subject to review at the end of three years, for breeding wilt-resistant varieties without altogether giving up the academic side of the investigation. The Cotton Breeder of the Agricultural Department at Dharwar had in hand some promising wilt-resistant strains, one of which a cross, known as *Jayawant*, was finally selected, and its seed is now being distributed by the help of a Seed Distribution Scheme financed by the Committee. *Jayawant* has all the desirable characters of its two parents—*Dharwar* 1, a high yielder though susceptible to *wilt*, and *Dharwar* 2, a wilt-resistant but poor yielder—and has already spread over an area of nearly 140,000 acres. It is hoped that this new wilt-resistant variety will soon cover the entire Gadag tract. The scheme was reviewed in December 1931 and was closed down at the end of May 1932, as recommended by the Conference convened by the Director of Agriculture, Bombay Presidency, in April 1931 to discuss the work done on *wilt* at Dharwar. The summary of the important results is given below :—

1. A strain of the fungus *Fusarium Vasinfectum Atk* is the cause of the *wilt* disease.

2. *Fusarium* fungus is not a single fungus but is split into differentiated physiological forms.

3. The range of temperature within which the *wilt* fungus lives on *agar* medium is 18° C. to 40°C. The disease is most severe at soil temperature 20° C, to 27° C., decreases at 28° C. to 31° C. and is completely checked at 32° C. This discovery is useful for testing new types of cotton for wilt resistance, before they are put in the hands of the grower.

4. The disease is carried in cotton seed.

60. *Khandesh Cotton Breeding Scheme.*—The scheme was started in 1926, extended in 1931 for a period of six months, and closed down in March 1932. The chief object of the scheme was to give a thorough test to a cross known as *Banilla* which had been made some years before by the Agricultural Department. This cotton is superior to local mixture and *N.R.* in ginning percentage and length of staple but there was some doubt about its yield. The work of the past five years and a half shows that under field conditions *Banilla* is as good a yielder as or even a better yielder than *N.R.*, a heavy yielding type, and the proof that this cotton is more paying than other cottons is to be found in its expansion from 40 acres in 1926 to over a lakh of acres in 1930 without the help of the Agricultural Department. The area under this cotton extended to 1½ lakhs of acres in 1931-32.

The Committee sanctioned in December 1930 a Seed Distribution Scheme for this cotton in consideration of its being more remunerative than *N.R.* *Banilla* has, however, two defects, viz., susceptibility to *wilt* and falling off in spinning capacity from 20's to 14-15's counts since it was first selected. Preliminary work of isolating wilt-resistant, high-yielding types of cotton with good spinning qualities was carried on side by side with the testing of *Banilla* and a few promising strains have already been obtained. These will be further tested at Jalgaon where a Breeding Scheme sanctioned by the Committee was started during the year under report.

61. *Jalgaon Cotton Breeding Scheme* was sanctioned in December 1931 for a period of five years at an annual cost of Rs. 7,000 and it commenced work in April 1932. The object of this scheme is to obtain by breeding a high-yielding, high-ginning, wilt-resistant, good spinning cotton to replace *Banilla*. The Committee supplies funds for the staff and equipment, the Plant Breeder being provided by the Bombay Government.

62. *Broach Cotton Breeding Scheme.*—This scheme also commenced work in April 1932. It was sanctioned in December 1931 for a period of five years at an estimated cost of Rs. 13,000 per annum for the purpose of producing a wilt-resistant cotton of high ginning percentage and good fibre for the newly constituted Nerbudda-Mahi Protected Zone.

63. *The Sind Physiological Scheme* completed the sanctioned period of five years during the year under report, when it was extended for a further period of five years. The scheme consists of physiological investigations into certain problems connected with the dates of sowing, water requirements of the cotton plant, general physiology of the plant under perennial irrigation and effects of *alkaline* salts on the growth of the cotton plant. The work so far done has given several practical results some of which are definitely conclusive while the rest have paved the way for future investigations. The chief results up to date are summarised below :—

1. March 15th to May 15th is the optimum sowing period for cotton under irrigated conditions in Sind.

2. Due to uncontrollable factors such as rain, water-table, etc., no definite conclusions have yet been arrived at with regard to the quantity of water required by the cotton crop and to the suitable interval between two waterings. A duty of 100 or 37 inches of water in five months with judicious intervals of irrigations according to the stages of plant growth appear to give satisfactory results on average soils.

3. Enough nitrogen in a soluble form is available in the soils at the beginning of the growing season and the nitrification is fairly active throughout thereafter but there is actual deficit of available nitrogen at the flowering and bolling stages indicating thereby the advantages of the application of quick-acting nitrogenous manures at the flowering and bolling period.

4. *Punjab-Americans* and *Egyptians* are both capable of high individual yield but the stand of the latter is poor, due to the attack of white ants which seem to be partial to Egyptian cottons.

5. All Egyptian varieties suffer from "*Red Leaf*" disease.

6. None of the four varieties tested, viz., 27 *W.N.*, *Ashmouni*, *Akala* and 4*F.*, is resistant to the harmful effects of soil alkalinity though 27 *W.N.* appears to stand better than the rest.

The work on the same lines as hitherto will continue.

Central Provinces.

64. *The Central Provinces Breeding Scheme* commenced work in 1923 and was extended in 1928 for a further period of five years. The main object of the scheme is to obtain a wilt-resistant, high-yielding and superior quality cotton and to ascertain the cause of low yield of cotton in Berar. The Department of Agriculture had begun work on cotton selection some time before the scheme was sanctioned by the Committee and it was therefore possible to obtain much earlier than otherwise a pure strain, *Verum* 262, which is a high-yielding wilt-resistant variety capable of spinning 20's to 22's against 8's to 12's of local *Oomras*. Due to a substantial premium paid for this cotton, a very great demand has sprung up for its seed, which is being widely distributed in the Central Provinces and Berar by the aid of a Seed Distribution Scheme financed by the Committee. Two new high-yielding and wilt-resistant strains of *Verum* 262 have since been isolated and one of them, a late variety, is suitable for standard warp counts upto 30's. It is best suited to localities where the rains extend beyond September, and in these localities it is gradually replacing its parent. The other strain, an early variety, has been selected to meet the demands of the tracts that suffer from early frosts and rapidly drying soils which require an early

maturing variety. Another new strain, *No.* 438, has proved very satisfactory, and it is also likely to prove superior to *Verum* 262. *Bani E.B.*, 31 has again proved satisfactory during the year under report. It is superior to *Bani* 306 by about 5 per cent. in staple length and is capable of spinning standard warp counts upto 41's. The introduction of groundnut in rotation has given very satisfactory results and much attention is therefore being paid to breeding high-yielding varieties of groundnut and also to devising means of lifting groundnut cheaply. The best type, *Akola No.* 10, has consistently given the highest outturn of 2,260 lbs. per acre, and the introduction of a special plough and the method of simultaneous lifting and ploughing have reduced the cost of cultivation by Rs. 5 per acre in addition to the land being ploughed up six months before the sowing season.

United Provinces.

65. *The United Provinces Entomological Extension Scheme.*—Mention was made in last year's report that the details of this scheme would be given in this report. The scheme has as its object the control of *Pink Boll-worm* in a selected area of about 4,700 square miles by heat treatment of all cotton seed produced in that area. It requires fitting up every ginning factory in the selected area with a seed heating machine to kill all the larvæ contained in the seed without affecting the vitality of the latter. The scheme entails a recurring expenditure of Rs. 3,35,000 over a period of five years and provision for machinery at an approximate cost of Rs. 6,25,000. The Committee at its meeting held in December 1931 agreed to sanction the scheme provided the United Provinces Government were prepared to bear the cost of machinery and to give an undertaking that they would endeavour to pass any legislation which may be required for proper working of the scheme and that they would extend the scheme to the whole province if it proves a success during the first five years. The Committee's proposals are still pending with the Government of the United Provinces.

Punjab.

66. *Botanical Scheme.*—It commenced work in August 1925 and was extended in July 1929 for a further period of five years from the 1st April 1930. The Committee has provided a Cotton Research Botanist and a grant for special staff and equipment in addition to what the Punjab Government provides for the study of the problems connected with cotton grown in the Punjab Canal Colonies where a very large area is cropped with American cotton. Periodic "failures" of this crop both as regards yield and quality made it necessary to start an investigation into the cause and to try and obtain a suitable variety which could replace the 4*F* cotton now extensively grown. The Botanist in charge produced, after five years' work, a strain which appeared promising but it had to be given up as it proved very susceptible to *Jassid* attack. He had, however, a few *Jassid*-resistant types in hand and attention is now being paid to their tests. One of these types—an early variety—has shown again this year satisfactory resistance

to the pest and efforts are being made to multiply its seed as quickly as possible. The application of quick-acting nitrogenous manures towards the end of August has been found again to give considerable increase of yield. Nitrate of soda could be applied with advantage even a little later.

67. *The Entomological Scheme* started work in 1926 and was extended in 1930 for a further period of two years. The object of this investigation is to ascertain the reason for the difference in the incidence of the *Pink Boll-worm* (*Platyedra gossypiella*) between the South-East Punjab where it is serious and the Canal Colonies, where its damage is negligible. The work of the first four years has definitely proved that temperature is the principal factor in the emergence of the moth and further investigations have shown that humidity also plays an important part in the life-history of the insect. There is therefore little possibility of the *Boll-worm* pest becoming dangerous in the Canal Colonies unless the climatic conditions of the Punjab are changed due to the extension of Canal irrigation. The following is the summary of the important results obtained during the year :—

1. The number of eggs laid by *Pink Boll-worm* increases from July, reaching the maximum in the middle of September to the middle of October.

2. At any constant temperature below10° C. and above 37° C. the moth failed to lay eggs and the eggs also failed to hatch, the maximum number of eggs being laid at 25° C. constant. The time taken for hatching varies from 17-18 days at a constant temperature of 15° C. to 4 days at 33° C. to 35° C.

3. Larvæ continued to come out of the double seeds for about a month when the seeds containing larvæ were subjected to constant temperatures of 25° C., 27° C., 30° C. and 33° C., and soaked in water for 2-8 hours every week but they all died when the temperature was raised to 36° C.

4. The moths continued to lay eggs at the room temperature (27° C. to 33° C.) so long as the humidity was about 20 per cent. and failed to lay them when the humidity was lowered to 10 per cent. Egg laying was also stopped at a constant temperature of 35° C., when humidity fell below 60 per cent. and exceeded 90 per cent. Hatching did not take place at 33° C. constant when humidity was lowered below 50 per cent.

5. The *Boll-worm* attack is more severe on American cotton than on *desi* cotton.

6. Light traps are effective only when the temperature ranges between 23° C. and 30° C.

68. *White Fly Scheme.—White Fly* (*Bemisia gossypiperda*) is a sucking insect that does damage to cotton and other crops. The Department of

Agriculture started work on *White Fly* in 1928, and in 1929 one of the Committee's research scholars was deputed to study the insect at the British Cotton Growing Association's estate, Khanewal, where it was first observed causing damage. The Committee, at its meeting in December 1930, was convinced that the *White Fly* pest was of sufficient importance to justify a more thorough investigation and sanctioned the *White Fly* scheme for a period of three years which commenced work in May 1931. The work of the year under report shows that the *White Fly* attack is more severe on early-sown crop and also on the crop that received low irrigation than on late-sown and heavy watered crop and the yield is inversely proportional to the incidence of attack. One spraying in July or August gave an increase of 1 *maund* and 39 *seers* and 2 *maunds* and 35 *seers* of seed cotton per acre respectively and when the crop was sprayed twice the increase went up to 4 *maunds* per acre. The application of nitrogen in readily available form gave a vigorous growth and counteracted the effects of attack.

69. *White Fly Spraying Scheme.*—This is only supplementary to the *White Fly* Scheme mentioned above, and was sanctioned in August 1932 for a period of one year at a cost of Rs. 11,250. The investigations of the *White Fly* Scheme have already resulted in the discovery of insecticides which would kill the *White Fly* without causing damage to the cotton crop, but the results of the spraying experiments on small areas are misleading as the insects can fly to the sprayed plants from the unsprayed areas. The object of the scheme is therefore to carry on large-scale spraying experiments with different kinds of insecticides for obtaining definite results on the economics of spraying on large areas. The experiments will be carried out to ascertain the following points :—

1. The most suitable and economic insecticide and the proper time for spraying or dusting.

2. The form in which the insecticide should be applied—dust or spray.

3. The various methods and appliances for spraying and dusting the field crops.

70. *The Root-Rot Scheme* was sanctioned in August 1932 for a period of three years at a total cost of Rs. 13,506. *Root-Rot* attacks both American and *desi* cottons, mainly in the Canal-irrigated tracts, and the damage done by it is estimated at Rs. 15,75,000 every year. The investigations carried out by the Botanical section of the Agricultural College Research Institute, Lyallpur, go to show that a fungus of the type of *Fusarium* is present in the affected plants. The disease appears ordinarily in the last week of June when the crop is about two months old and continues up to the middle of September. It spreads in a circle among healthy plants and the affected ones dry up very quickly. It was also observed that the soil of the affected area had a bed of *Kankar* underneath but the death-rate did not decrease when *Kankar* was removed. Some plants escaped the disease while others

close to them were attacked, and seeds of plants which remained unaffected in one year did not produce plants resistant to the disease when sown next year. The problem is proposed to be attacked on the following lines :—

1. Study of the life-history of the organism and the conditions causing the disease.

2. Isolation and inoculation tests of causal organisms, if any, on plants and cultures.

3. Study of the climatic and soil factors influencing the disease.

4. Control measures, remedial and preventive.

Bikaner.

71. *Gang Canal Scheme.*—This scheme started work in January 1931 at Ganganagar. It was sanctioned for five years for the purpose of obtaining by selection and hybridization improved types of Indian and American cottons capable of spinning at least 25's counts. Agronomic problems also will be studied, such as the best rotation for cotton, the improvement of yield by rotation and the correct adjustment of irrigation water. Of the 67 pure types that were tested only eight proved worth further trial. Experiments have been started for finding out the optimum sowing dates and the optimum water requirements and arrangements have also been made to start manurial tests. Most of the American and Egyptian types of cotton that could be had in India have been sown and they will be tested minutely as some of them might prove suitable for this tract. The pure types of *desi* cottons grown in the surrounding provinces have also been sown for comparative tests.

Hyderabad.

72. *The Botanical Scheme* commenced work in 1929 at Parbhani for the purpose of studying cottons which go to make up *Gaorani* or *Bani* cotton and for the production of pure types of high economic value. *Gaorani* or *Bani* is probably the best of the indigenous cottons from the point of spinning but it is a poor yielder with low ginning percentage. It is therefore being replaced by high-yielding, short-staple *neglectums* which have become of late popular with the grower. It is hoped to obtain, by selection and crossing, high-yielding and high-ginning types with good spinning qualities which would prove more remunerative than short-staple *neglectums*. The Botanist in charge has already secured a few promising selections which are under observations. Selfed seed of *Banilla* cotton enough for ten acres and a fair quantity of *Gaorani* seed, selected by intensive roguing, have been obtained during the year and they will be multiplied for distribution.

73. *Survey Scheme.*—This scheme was sanctioned in December 1930 for a period of four years, as recommended by the Agricultural Research Sub-Committee, for carrying out a detailed survey of the cottons grown in Hyderabad State as an essential preliminary to scientific improvement of the crop and the extension and distribution of the seed of improved varieties. The scheme, as sanctioned, entailed the employment of a whole-time officer to collect plant types from cultivators' fields all over the State and to test them on the Central Farm at Parbhani. The Committee at its meeting in August 1932 sanctioned the appointment of another officer and extended the scheme for one more year as it was considered hardly possible for one officer to complete the work satisfactorily in four years. The study of vegetative and lint characters of plants grown out of the representative samples of cotton seed obtained from Aurangabad and Parbhani districts shows that the crop grown in these districts consists of mainly three types—*G. neglectum*, *G. indicum* and *G. hirsutum*—with a very small percentage of crosses which do not fall under any known variety. These results are confirmed by the survey of the cultivators' crop in a few representative villages.

Burma.

74. *Cotton Improvement Scheme.*—This scheme was sanctioned in December 1930, for a period of three years, for cotton improvement in Burma, and it started work in April 1931. The Department of Agriculture has in hand three improved varieties of cotton and attempts are being made at Mahlaing to multiply and distribute their seed. Experience has, however, shown that distribution of seed of improved varieties is of little consequence unless the local methods of agriculture are first improved. The object of the scheme is therefore to introduce into general practice the better methods of cultivation such as conservation of moisture in the soil, preservation and utilization of all farm waste as manure, winter ploughing and early preparation of soil, drill sowing and intercultivation. The Committee's funds are being used for recruiting six demonstrators each year, up to a total of 18 in the third year, for demonstrating better methods of agriculture. During the year under report the first batch of six demonstrators were appointed, each in charge of the three different demonstration holdings, and the necessary implements were purchased. The season was particularly unfavourable but yet the work of the year was on the whole satisfactory. On many of the demonstration holdings in Meiktila district the yield of seed cotton went up to 290 lbs. per acre against the average of 95 lbs. for the district while on three of them it yielded at the rate of 365 lbs. per acre.

Baroda.

75. *The Root-Rot Scheme* commenced in Baroda in February 1932. It was sanctioned in July 1931, for a period of two years in the first instance, for investigation into *Root-Rot* which does great damage to cotton in the sandy alluvial soils of Gujerat. The scheme also includes the breeding of suitable strains of cotton resistant to *Root-Rot*, as in the case of *wilt*.

76. *Scheme for comparative tests between* 1027 *A.L.F. and* 1*A cottons.*—This scheme commenced work in April 1932 and it was sanctioned at a total estimated cost of Rs. 4,280. Early in 1926 the Government of Bombay agreed to the policy of the Department of Agriculture of maintaining only one variety of cotton, viz., 1027 *A.L.F.*, in the whole tract south of the river Nerbudda, and relaxed some of the provisions of the Cotton Transport Act by permitting the transport of cotton by road between the three protected areas, viz., the Surat Zone, South Surat Zone and the Olpad-Ankleshwar Zone, on a definite understanding that in the event of any inferior cotton being introduced in any of these areas the road restrictions would be reimposed. In 1927 the Sonsek group of Co-operative Societies were found distributing the seed of Surat 1*A*, and wanted to have the freedom to grow this cotton in Ankleshwar area on the plea that while this cotton was nearly as good as 1027 *A.L.F.* in spinning quality it was much superior to it in yield and ginning percentage. The trade of the locality disagreed with the Co-operative Societies regarding the spinning quality of 1*A* cotton and maintained that the superior spinning quality claimed for this cotton was due to the fact that it was not a pure cotton but a mixture of 1*A* and 1027 *A.L.F.* The Committee therefore thought it desirable to verify, before it could offer its opinion on the matter, the claim of the Sonsek group of Co-operative Societies by means of comparative tests for yield and spinning quality of the two cottons in their pure condition. The Bombay Agricultural Department has undertaken to carry out field tests in the Surat district but as the cotton policy of the Navsari district in Baroda State is the same as in the Surat district, the Committee sanctioned this scheme for similar tests in the Navsari district also.

CHAPTER IV.

SEED EXTENSION SCHEMES.

77. THE Indian Central Cotton Committee, at its monsoon meeting in 1929, decided to assist the Agricultural Departments in wider distribution of the seed of improved varieties and sanctioned, during the past two years, twelve seed distribution schemes, of which two have not yet been started. Two more schemes were sanctioned in August 1932.

78. *Madras.*—As stated in last year's report, an irrecoverable grant of Rs. 18,000 over a period of five years was sanctioned for the extension and distribution of the seed of the improved *Cambodia* cotton. The Committee provides the pay of an Agricultural Officer to act as Grader, Adviser and Business Manager to a group of seed societies in the Coimbatore district which grow the selected varieties of *Cambodia* and gin and sell the lint collectively and assist the Agricultural Department in the distribution and extension of the improved seed. About 1,200 acres were sown with pure seed during the year and it is expected that this crop would yield not less than 3,000 bags of pure seed, sufficient to sow 12,000 acres in the next season.

Two new schemes were sanctioned in August 1932 for the distribution of *Co.* 2 (*Cambodia*) in Coimbatore and Salem districts and *H.* 1 (*G. herbaceum*) in the Westerns tract at an estimated cost of Rs. 81,310 and Rs. 18,860 respectively. No work has yet been started.

79. *Bombay Presidency.*—Of the seven schemes sanctioned in 1929 and 1930 five were in operation during the year and the remaining two schemes have still been held up pending ways and means of financing the purchase of seed being devised.

80. *Hubli.*—A grant of Rs. 40,800 for a period of five years was sanctioned to the Hubli Cotton Sale Society, Ltd., in the Dharwar district for the distribution and extension of the improved *Jayawant* and *Gadag* 1 cottons. Of the amount of Rs. 8,560 spent during the year Rs. 3,560 went to the Bombay Agricultural Department for roguing, etc., to maintain purity of seed and the balance to the Society for seed distribution. The Society organized a reserved area of 17,640 acres and distributed over 1,100,000 lbs. of pure seed for sowing during the year.

81. *Gadag* (*Extension and Supplementary*).—The Gadag scheme is the same as the Hubli scheme, except that the total subsidy including the supplementary grant sanctioned in December 1930 amounts to Rs. 66,323. The total expenditure for the year 1931-32 came to Rs. 12,848 of which Rs. 2,143 went to the Gadag Cotton Sale Society which organized a seed-growing area of 22,200 acres and distributed about 1,245,000 lbs. of pure seed.

82. *Surat.*—This scheme was sanctioned in 1929 for two years and extended for a further period of two years in December 1931. The Committee sanctioned for the year 1931-32 Rs. 2,000 for the pay of a Graduate Assistant and Rs. 5,000 for the opening of seed depots for sale in the Surat tract of the seed of the improved variety known as 1027 *A.L.F.* Twenty-one depots were organized during the year and they dealt with 2,306,525 lbs. of pure seed of which 1,572,060 lbs. went to Rajpipla, Chhota Udepur, Jambughoda and Baroda States.

83. *Khandesh.*—In December 1930 the Committee sanctioned this scheme for a period of five years at an estimated net cost of Rs. 1,60,340 for the extension of *Banilla* cotton in Khandesh area. This cotton, the result of early work by the Bombay Agricultural Department, has been extending rapidly on its own merits in spite of the fact that it is somewhat susceptible to *wilt* and that it has deteriorated in spinning value since it was first tested. The work is in progress to secure a more satisfactory strain, but *Banilla* even as it stands at present is far superior to local varieties and gives better returns. The scheme commenced work in May 1931 and about 135,000 lbs. of pure *Banilla* seed have been produced for multiplication and distribution next year.

84. *Athani.*—In November 1929 the Committee sanctioned this scheme for a period of five years at a total estimated cost of Rs. 39,482 for multiplication and distribution of seed of *Jayawant* in the Athani taluka of the Belgaum district. But the scheme could not be started owing to the difficulty of devising ways and means of financing the purchase of seed. In December 1931 the Committee sanctioned revised proposals put up by the Director of Agriculture, Bombay, amounting to Rs. 46,757 for a period of five years. The scheme commenced work in April 1932.

85. *Haveri and Bailhongal.*—These schemes were sanctioned in 1929, but owing to the difficulty of devising ways and means of financing the purchase of seed they have not yet started work.

86. *Sind.*—A grant of Rs. 93,000, spread over three years, was sanctioned in December 1930 for the extension of improved cottons in the Barrage area in Sind and also for organizing and carrying out demonstrations, comparative tests and propaganda work to facilitate the extension of improved cottons when perennial irrigation becomes available. The methods of cotton cultivation were demonstrated in 15 centres on the right bank of the Indus where cotton has never been established before, and *desi*, 4*F*, 285*F* and 289*F* varieties were compared for yields in nine centres on the left bank of the river. The work of the seed multiplication of the improved *desi* variety and the improved varieties of Punjab-American cotton is in progress.

87. *Central Provinces.*—Rs. 50,359 were sanctioned for one year from the 1st August 1931 to the 31st July 1932 for additional staff to supervise the roguing, collection, ginning and marketing of *Verum* 262 cottons. A

large quantity of pure *Verum* seed, amounting to 3,676,960 lbs., was sold by the Department of Agriculture for sowing in 1931, while in addition 1,457,456 lbs. of reasonably pure seed were distributed extra departmentally. The scheme was again extended in August 1932 for a further period of one year at an estimated cost of Rs. 26,316-8-0.

88. *Hyderabad.*—A grant of Rs. 5,000 for three years was sanctioned for temporary staff to supervise the extension of pure seed in Raichur and Gulbarga districts. 207,500 lbs. of *Jayawant* and 49,170 lbs. of *Gadag No.* 1 seed were distributed in 66 villages during the year.

89. *Punjab (erection of ginnery at Lyallpur).*—At a certain stage in the production and propagation of new types of cottons, an experimental ginnery becomes a necessary adjunct of a cotton research station to deal with the large number of cottons from the experimental plots there and to ensure proper supervision of ginning operations. Such a stage having been reached at Lyallpur, the Committee in July 1930 sanctioned a sum of Rs. 18,125 for the erection of the ginnery. The erection of building and the machinery was completed during the year under report and a trial run of the machines was also made which were found to be in perfect working order. Full advantage of the ginnery will be taken hereafter.

RESEARCH STUDENTS.

90. One more important function which the Committee is performing is the training of research workers in several of the sciences pertaining to cotton. Distinguished graduates of science from Indian Universities are placed under the guidance of experienced investigators working on the Committee's schemes, at the Institute of Plant Industry, Indore, or in the Committee's Technological Laboratory. The scholarships are usually held for a period of two years but extensions are frequently given. Fifty students have been given scholarships of whom six are still under training, six resigned before completing their training, and twenty-eight have been taken on the Committee's staff or have joined Provincial or State Agricultural Departments. During the year under report one of the Committee's ex-research students was awarded a foreign scholarship, but no research scholarship was granted for training in India. Two students completed their training during the year and reverted to their appointments in the Provincial Agricultural Department from where they were selected. Expenditure under this head during the nine years ending the 31st August 1932 amounted to Rs. 1,99,680-10-9.

P. H. RAMA REDDI,
Officiating Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1931-32.

INTRODUCTION.

THE present report contains an account of the work done at the Technological Laboratory from 1st September 1931 to 31st August 1932. It will be seen from a perusal of this report that the testing of agricultural and trade samples was maintained at the high level achieved in 1931 and that good progress has also been made in the research activities of the Laboratory. Experiments in connection with several items of research approved by the Committee were concluded and their results have either been published in Technological Bulletins or are in the course of preparation. Principal amongst these must be mentioned the completion of the work relating to the determination of the moisture content in bales of different trade descriptions and the variation in the weight of bales of cotton stored n a godown at the Cotton Exchange Building, Sewri, under ordinary conditions of humidity prevailing in Bombay in the course of a year.

The work done at the Laboratory will now be described under the following five heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the samples of different cottons tested during the period under review together with the names of the Agricultural Officers from whom these were received :—

BOMBAY.

(1) *The Cotton Superintendent, S.M.C., Dharwar.*—2 samples of Kumpta Galgalli and Kumpta Jamkhandi ; 11 samples of Kumpta grown in different districts.

(2) *The Cotton Breeder, S.M.C., Dharwar.*—9 samples of Dharwar, Jayawant and other strains.

(3) *The Cotton Breeder, Khandesh, Dhulia.*—12 samples of Banilla, N. R. and Local cottons grown in different districts.

(4) *The Graduate Assistant, Hubli.*—3 samples of Jayawant cottons of different generations.

(5) *The Professor of Agriculture, Agricultural College, Poona.*—4 samples of N.R. cotton for manure experiments.

(6) *The Botanist in Sind, Sakrand.*—11 samples of different strains grown at the Agricultural Research Station, Sakrand.

(7) *The Cotton Supervisor, Indus Left Bank, Mirpurkas (Sind).*—2 samples of green-stained Sind-American cottons.

(8) *The Cotton Breeder, South Gujarat, Surat.*—3 samples, one each of Surat 5[1], White Flower and 1A Long Boll.

(9) *The Cotton Physiologist, Surat.*—4 samples of 1027 A.L.F. cottons.

(10) *The Superintendent, Agricultural Research Station, Surat.*—5 samples of 1027 A.L.F. and other selections.

(11) *The Cotton Breeder, North Gujarat, Viramgam.*—3 samples of Wagad Local and selections.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—23 samples of *desi* varieta tests, American varietal tests and 4F and 289F mixtures of different percentages ; 13 samples of P.A. 4F, P.A. 289F and other strains and 6 samples of P.A. 4F for watering experiments.

(2) *The B.C.G.A. (Punjab), Ltd., Khanewal.*—2 samples of P.A. 289F and M.P. cottons.

UNITED PROVINCES.

(1) *The Assistant Economic Botanist, Cawnpore.*—7 samples of C. 402, C. 520 including a control sample.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—2 samples of IXC 108 and IXC 109 and 2 samples of strains 67 and 75.

(2) *The Agricultural Demonstrator, Tiruppur.*—One sample of Cambodia Co. 2.

(3) *The Agricultural Demonstrator, Nandyal.*—One sample of Nandyal 14.

(4) *The Farm Manager, Nandyal.*—One sample of Cambodia Co. 2 grown at Nandyal and 3 samples of different strains.

(5) *The Cotton Assistant, Agricultural Research Station, Guntur.*—4 samples of strains Nos. 171, 43, 45 and 49.

(6) *The Superintendent, Agricultural Research Station, Koilpati.*—One sample of Cambodia Co. 2.

CENTRAL PROVINCES.

(1) *The Economic Botanist to Government, Nagpur.*—3 samples of Late Verum, Bani 306 and Bani 31.

MISCELLANEOUS.

(1) *The Cotton Research Botanist, Parbhani (Hyderabad).*—7 samples of Gaorani, Bani, BXXI, etc., and 7 samples of Bani, Verum and other strains.

(2) *The Agricultural Officer, Port Blair, Andamans.*—One sample of Sea Island cotton.

(3) *The Superintendent, Agricultural Station, Jagudan (Baroda State).*—2 samples of Wagad cottons.

(4) *The Crop Botanist, Malwa Division, Ujjain.*—6 samples of K. 22, Malvi, G. 16, Cambodia and other strains.

(5) *The Director, Institute of Plant Industry, Indore.*—10 samples of Malvi, Bani, Roseum and other selections grown at the Institute's Farm, Indore.

It was mentioned in my last Annual Report that the Indian States were now coming forward to avail of the facilities for testing promising strains offered by the Laboratory. This feature will be borne out by the above statement from which it will be seen that among others, Hyderabad, Baroda and Ujjain sent a number of samples for tests. The desire on the part of the Indian States to adopt accurate methods of determining the promising strains with a view to assisting the cotton breeder in his selection work is further shown by the fact that during the year under review one of them, Ujjain, asked for and received assistance from the Laboratory in the matter of opening a small fibre-testing laboratory near its agricultural farm. For this purpose testing instruments of a simple nature were prepared at the Laboratory workshop. These together with full particulars and specifications of more complicated apparatus and working instructions for

all were supplied to the Crop Botanist, Ujjain. This is a step in the right direction, and it is to be hoped that other States will follow suit so that before long a chain of small fibre-testing laboratories will be established all over the country.

The increase in the work of the Technological Laboratory from year to year is shown in the following Tables which give the distribution of samples, lots and yarns spun since 1924-25.

TABLE I.—*Distribution of Samples Spun*, 1924–32.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	Totals, 1924–32
Bombay ..	18	26	22	22	28	66	89	69	340
Punjab ..	14	1	..	..	42	30	10	44	141
United Provinces ..	7	..	6	11	9	7	16	7	63
Madras ..	2	19	50	23	30	51	66	15	256
Central Provinces ..	2	..	3	2	2	5	3	3	20
Miscellaneous .	3	11	..	6	6	27	28	33	114
Total ..	46	57	81	64	117	186	212	171	934
Standard Cotton tests ..	8	54	49	64	33	34	27	18	287
Trade tests and special tests ..	..	..	..	..	..	37	89	134	260
Total tests .	54	111	130	128	150	257	328	323	1,481

TABLE II.—*Distribution of Lots Spun*, 1924–32.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	Totals, 1924–32
Bombay ..	36	52	44	44	53	107	90	69	495
Punjab ..	26	4	..	..	83	41	10	44	208
United Provinces ..	14	..	12	22	18	14	16	7	103
Madras ..	4	38	100	46	60	85	66	16	415
Central Provinces ..	3	..	6	4	4	10	4	3	34
Miscellaneous .	3	22	..	12	9	33	29	33	141
Total ..	86	116	162	128	227	290	215	172	1,396
Standard Cotton tests.	34	176	142	178	68	64	54	36	752
Trade and special tests.	..	..	..	..	..	37	119	186	342
Total tests .	120	292	304	306	295	391	388	394	2,490

TABLE III.—*Distribution of Yarns Spun, 1924–32.*

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	Totals. 1924–32
Bombay	103	152	132	132	159	322	253	203	1,456
Punjab	106	14	..	..	254	113	31	136	654
United Provinces	27	..	36	66	54	42	40	22	287
Madras	12	108	278	138	180	255	199	53	1,223
Central Provinces	8	..	18	12	12	30	12	9	101
Miscellaneous	3	58	..	36	27	99	100	93	416
Total	259	332	464	384	686	861	635	516	4,137
Standard Cotton tests.	95	514	423	447	290	223	309	136	2,437
Trade and special tests.	..	..	..	..	..	80	343	502	925
Total tests	354	846	887	831	976	1,164	1,287	1,154	7,499

It will be seen that the number of samples spun during 1931-32 is practically the same as in 1930-31 while the number of lots shows a small increase. With the present equipment and staff this number must be taken to represent very nearly the maximum which can be tackled in the course of a year. The number of yarns spun during the current year shows a small decrease which is due to the measures adopted last year to meet the growing demand on the resources of the Laboratory. This consists primarily in cutting down the number of counts into which a cotton is spun to a minimum number with a view to testing as many samples as possible. It will also be seen that the number of agricultural samples spun shows a small decrease as compared with similar samples spun in 1930-31. This is simply due to the cotton crop of 1931-32 being late in several provinces, notably in the Punjab, Bombay and Berar.

Advantage was taken of the comparatively late arrival of agricultural samples by putting through as large a number of technological samples as possible which consequently shows an increase as compared with the last year's figure.

The following Table shows the staff employed in the Technological Laboratory from year to year since 1924 :—

As at August 31st in	1924	1925	1926	1927	1928	1929	1930	1931	1932
Technical staff	8	11	20	24	27	27	32	32	32
Research students	1	3	6	4	3	2	1	1	..
Fumigation chemists	..	..	2	4	2	2	2	2	2
Totals	9	14	28	32	32	31	35	35	34

The staff shown above consists partly of Research Assistants who are engaged on various research problems and partly Junior Testers who perform the routine work involved in the testing of different samples of cotton. As is well known, these samples are subjected to a thorough test both for their fibre-properties and yarn characteristics which consist of the determination of fibre-length and fibre-weight on the one hand and lea test, single-thread test, actual counts, actual twist, yarn neppiness and yarn evenness on the other. An idea of the total number of tests made in connection with these samples may be had from the fact that in 1931-32 the yarn tests alone amounted to nearly half a million.

Classification of Samples.

It will be seen from Tables I to III that the different samples tested at the Laboratory fall under one of the following four heads :—

(*a*) Agricultural samples.
(*b*) Standard cottons.
(*c*) Trade samples.
(*d*) Technological samples.

(*a*) *Agricultural samples.*—The agricultural samples are received from the agricultural officers and cotton breeders, and consist mostly of new and promising strains which are being evolved at the different experimental farms and for which a reliable estimate of their spinning performance is required to enable the breeder to decide at as early a date as possible whether or not they are worth further trials. Besides these, agricultural samples are received in connection with different physiological or botanical experiments such as the effect on fibre-properties and spinning performance, incidence of pests, different applications of water, different dates of sowing, etc. These samples form the bulk of all the samples tested at the Laboratory, and during the period under review their percentage was 53. The results of tests on these samples are embodied in spinning test reports, copies of which, although not published for general information, are supplied to the officers concerned and to the Provincial Agricultural Department in which these officers are working.

(*b*) *Standard Indian cottons.*—The standard Indian cottons are mostly improved varieties which have been introduced from time to time into general cultivation and which now cover about 15 per cent. of the total area of cultivation under cotton. During the year under review tests were made on the following standard Indian cottons :—

(1) Jayawant (Kumpta).
(2) Gadag 1 (Dharwar-American).
(3) Surat 1027 A.L.F.
(4) Wagad 8 (Dholleras).
(5) Punjab-American 4F.

(6) Punjab-American 289F.
(7) Mollisoni (Bengals).
(8) Aligarh A. 19 (Bengals).
(9) Cawnpore K. 22.
(10) Cawnpore-American C.A. 9.
(11) (*a*) Verum 262 (Nagpur).
(*b*) Verum 262 (Akola).
(12) Umri Bani.
(13) Cambodia Co. 2 (Cambodia 440).
(14) Nandyal 14 (Northerns).
(15) Hagari 1 (Westerns).
(16) Hagari 25 (Westerns).
(17) Karunganni C. 7.
(18) American cottons.

It may be mentioned here that three cottons, viz., Dharwar 1, J.N. 1 and Cambodia Co. 1 have been deleted from the list of the standard cottons. Dharwar 1 has now been completely replaced by the improved variety Jayawant which gives practically the same spinning performance but being much less susceptible to wilt, makes a better stand in the field and gives a higher yield; Cambodia Co. 1 has been replaced by Cambodia Co. 2 which has the same spinning performance but possesses a higher yield per acre as shown by field trials extending over several seasons. J. N. 1 has failed to appeal to the cultivator and has practically gone out of cultivation. It was realized that no useful purpose would be served in continuing tests on cottons which have either gone out of general cultivation or have been replaced by varieties which are capable of giving better monetary return to the grower.

I may also mention here that as American cottons reported upon annually in the Bulletin on Standard Indian Cottons were tested some 6 or 7 seasons ago, it was thought desirable to make fresh tests on the present-day American cotton. Messrs. E. D. Sassoon & Co. very kindly supplied samples of Low Middling and Middling cottons of 1930-31 crop for this purpose and the results of tests on these samples have been incorporated in the bulletin.

Some of these standard cottons are received fairly early in the season and the results of tests on such standard cottons were published at once in four-page Technological Circulars. These were later embodied in the "Technological Reports on Standard Indian cottons, 1932." In the year under review, four-page Technological Circulars were published on the following standard Indian cottons :—

(1) Umri Bani.
(2) Verum 262 (Akola).
(3) Verum 262 (Nagpur).*

(4) P.A. 289F.
(5) P.A. 4F.
(6) Jayawant (Kumpta).

The results of tests on these cottons are published in an annual bulletin entitled "Technological Reports on Standard Indian Cottons." Last year the results of a new test, called the 'Ballistic work of rupture,' were introduced for the first time in this bulletin. This year a new statistic, called 'fibre-length irregularity,' has been introduced for the first time, and its values have been calculated for the standard Indian cottons of three seasons. This has been done with a view to giving a physical measurement of the property of lint which is very important to the practical spinner, viz., the percentage of short hairs present in a cotton which, unless extracted as waste in the opening and cleaning processes, cause irregularity in the structure of yarn, thereby reducing its breaking strength. It is hoped that the insertion of this new statistic, defining an important property of a cotton, will prove useful to the practical spinner. The detailed method of calculating this statistic from fibre-length distribution results will soon be described in a separate bulletin.

(c) *Trade samples.*—Testing of trade samples was first undertaken in 1929-30 in response to the demand that the work of the Laboratory should be made more directly useful to the trade. A list of representative Indian cottons was drawn up, some of which were to be supplied by the East India Cotton Association and the others by the Bombay and Ahmedabad mills through their Associations. The samples supplied by the East India Cotton Association are approved by their Standards Committee, who also make a valuation report on these samples before sending them to the Laboratory. It follows, therefore, that the results of these tests, when available for a number of seasons, will give very useful and reliable information as regards the improvement or deterioration of any of these types. The results of tests on these trade samples are published, with the minimum possible delay, in the form of two-page Technological Circulars which are widely distributed to the trade. The following statement gives the descriptions of trade samples received for tests from these sources :—

Cottons supplied by the East India Cotton Association.

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Nanded.
5. Latur.
6. Muttia.
7. Punjab-American.
8. Broach.
9. Jagadia Farm.
10. Surat.
11. Navsari.
12. Dholleras (Wagadia).
13. Kalagin.
14. Kadi-Viramgam.
15. Westerns (Jhavaria).
16. Farm Westerns.
17. Coompta.
18. Upland (Gadag).
19. Bijapore.
20. Bagalkote.
21. Cambodias.
22. Tinnevelly.
23. Karungannis.

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

(*a*) *Bombay.*

1. Hubli Coompta.
2. Hubli Upland.
3. Sujalpur (Ujjain).
4. Ranala (Khandesh).
5. Yawal (Khandesh).
6. Nimbora Farm (Khandesh).
7. Ujjain.
8. Dhulia (Khandesh).
9. Hubli Coompta.
10. Bailhongal.
11. Broach (Salar).

(*b*) *Ahmedabad.*

1. Jagadia.
2. Kadi.

A list of the Technological Circulars published on these samples will be found under "Publications."

Besides the samples which were received in accordance with the arrangement entered into between the Indian Central Cotton Committee on the one hand and the East India Cotton Association and the Bombay and Ahmedabad Millowners' Associations on the other, two samples which possessed special features deserve to be mentioned.

One of these, submitted by a Bombay mill, was of a fairly good quality but it suffered very badly from stringiness. It contained an unusually large proportion of matted fibres. It was concluded from its general appearance and its behaviour in the blow-room that this defect was due to careless and defective ginning, which raised its waste losses and lowered its spinning performance. It was subjected to a thorough test in the spinning laboratory and in the end it was found that by suitably changing some of the settings it was possible to reduce its waste losses and obtain stronger yarns.

The second sample, received from another Bombay mill, was of Punjab-American cotton and suffered very badly from the defect of neppiness. This sample was also subjected to special tests with a view to ascertaining if by suitably changing the settings less neppy yarns could be obtained from it. It was found that in this particular case neppiness was inherent in the cotton itself and that such changes in settings as are ordinarily recommended for dealing with neppy cottons failed to produce any appreciable effect on the quality of yarns.

Mention may also be made of a sample of spindle banding manufactured from a high grade cotton at one of the Ahmedabad mills, which was sent to the Laboratory for comparative tests. This banding was examined for strength and durability, and its behaviour under working conditions was compared with the banding which is ordinarily used in the ring frames of

the Technological Laboratory. A detailed report embodying the results of these observations and containing some suggestions for improvement was sent to the mill concerned.

These three tests are of special importance since they show that as confidence of the trade and the industry in the work of the Laboratory is steadily increasing they have now begun to refer their difficulties to us. The Technological Laboratory has on its staff men who are qualified both for the scientific examination of the cotton fibre and the study of its behaviour in spinning processes and who, compatible with their other duties, are always willing to give such assistance and help to the industry as lies in their power. It may not be possible for them to find a solution in each and every case but even the attempt at the solution of such difficulties will very often prove a point of scientific importance and if at any time positive results are achieved they should be of great value and material help to the industry.

It may be mentioned here that the demand for testing ordinary mill samples was increasing to the extent of interfering with the normal activities of the Laboratory, and the Committee decided that such samples which have no special technological significance would only be tested on payment of a fee. The scale of fees fixed for such tests is as follows :—

For a full test	per sample	Rs. 50.
For a fibre and blow-room test	,, ,,	Rs. 25.
For a fibre or yarn test	,, ,,	Rs. 15.

(*d*) *Technological samples.*—These samples are tested in connection with the technological research on the spinning properties of cottons and their mixings and the influence of mechanical processes on the quality of yarn and their testing is undertaken alongside of the agricultural and trade samples, as opportunity permits.

The following Table contains a statement of the various reports, embodying the results of tests on these samples, issued during the period under review together with the corresponding figures for the previous years since 1924-25 :—

——	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32
Spinning Test Reports.	7	19	19	22	21	63	92	60
Fibre Test Reports ..	1	1	5	1	7	4	7	19
Yarn Test Reports ..	..	..	..	1	4	4	2	3
Totals ..	8	20	24	24	32	71	101	82

It will be seen that the number of spinning test reports shows a small decrease which is principally due to the late arrival of samples, as explained above. The number of fibre test reports, on the other hand, shows a large increase which is due to the receipt of many more samples for fibre tests as compared with the previous seasons.

Special agricultural tests.—It was mentioned in my last Annual Report that a number of tests were made on samples of Banilla cotton grown in the Districts with a view to ascertaining the average performance of the present-day crop of this cotton. In view of the importance, both to the Agricultural Department and to the trade, of the results of these tests, it was decided to repeat them in the following year. This year comparatively few samples of Banilla cotton, grown in the Districts, were received ; but, as they gave very similar results to those received last year, the results of all the tests were embodied in one report which is in the press.

Another series of interesting tests were those made on green-stained Sind-American cotton, samples of which were supplied by the Chief Agricultural Officer, Sind. It was found that Sind-American cotton, grown in the Jamrao Canal areas, has lately suffered from a decline in price owing to the appearance of green stain which was apparently due to the removal in ginning of green fuzz from its seed. A number of tests were made on samples of this cotton with a view to finding out whether, and to what extent, the presence of this green stain affects the spinning performance of this cotton. As a result of these tests it was found that most of the green stain was removed in the form of impurities by the normal treatment in the blow-room and the card-room, that although yarns spun from it were slightly greenish in shade as compared with those obtained from an unstained sample, after bleaching them with the ordinary treatment employed by a mill no trace of the green tint was left, the yarns from the stained and unstained samples becoming, in fact, indistinguishable. The strength of yarns spun from the green-stained sample was very nearly equal to that of yarns spun from the unstained sample. The bleaching was done through the courtesy of Messrs. Tata Sons, Ltd., at one of their mills. It will be seen from the above conclusions that the mere presence of green stain did not produce any serious defect in the cotton itself either as regards its spinning performance or as regards the colour of its yarns which could be bleached satisfactorily to whiteness by the ordinary bleaching process employed by a mill. As it was realized that the results of these experiments were of paramount importance to the cotton growers, the Committee decided to give them wide publicity by publishing them in the form of a leaflet.

Spinning tests on mixings of long-staple and short-staple Indian cottons.—Tests on mixings of Indian cottons, undertaken from time to time at the Technological Laboratory, have revealed some very interesting features. A bulletin describing the results of tests on various mixings made from Punjab-American 4F, Punjab-American 289F, Mollisoni, and Karunganni and Pulichai cottons was published during the period under review,

and a summary of it will be found under " Publications." Further samples of mixings of 4F and 289F, 4F and Mollisoni and Karunganni and Pulichai have been received and tested. The results of these experiments revealed the considerable harm done to good quality cottons by adulterating them with inferior types. These were regarded so important, both to the cultivators and the trade, that the Indian Central Cotton Committee decided to give them wide publicity by publishing their summary in the form of a leaflet.

Tests on samples of cotton grown with different applications of water.—The Cotton Research Botanist, Lyallpur, supplied samples of 4F cotton which were grown under similar conditions except that they had been given different applications of water. These samples were subjected to a very thorough examination, which, besides the usual fibre and yarn tests, included an examination of the samples for percentage of mature hairs. These tests were made with the object of throwing some light if possible upon the vexed problem of the occasional failure of the cotton crop in the Punjab. It was found, as a result of these experiments, that reduced rate of watering affected both the length and maturity of the fibres in an adverse manner, but that these defects could be remedied if the cotton was given a few additional waterings, even late in the season. The Committee agreed to the suggestion made by the writer that further tests on samples of cottons grown under similar conditions but with different applications of water should be made and that the Directors of Agriculture in different Provinces should be asked to supply such samples, if suitable irrigation facilities were available.

Technological Work.

High draft spinning.—The second series of tests relating to the application of high draft spinning to mixings of Indian cottons using the ordinary system and three systems of high draft spinning were completed some time ago. The results of these tests have now been published in Technological Bulletin, Series A, No. 19, a summary of which will be found under " Publications."

Combing of good quality Indian cottons.—One item of research in the programme of future work approved by the Committee related to the combing of good quality Indian cottons with a view to ascertaining their maximum spinning performance under these conditions. The experimental part of this work has now been completed on four Indian cottons, viz., Punjab-American 289F, Cambodia Co. 1, Surat 1027 A.L.F. and Nandyal 14. These cottons were combed to the extent of 20 per cent. and 30 per cent. respectively (1027 A.L.F. was combed to the extent of 26 instead of 30 per cent.). Yarns were spun both from the carded and combed slivers on the ordinary system as well as a four-roller high draft system. The comber waste, in each case, was mixed with a suitable low grade Indian cotton, and the mixings spun into appropriate counts with the object of taking into consideration the economic side of the problem. The results of these experiments are now being written up and will be published in the form of a bulletin.

Settings and Twists in the Fly Frames.—Another item of the programme approved by the Committee related to the effect of different settings and twists on the quality of yarns spun from a cotton. This work has now been completed on three Indian cottons, viz., K22, 4F, and 1027 A.L.F. The results of this work will be described in a bulletin, the preparation of which will be undertaken after the bulletin on Combing of Good quality Indian Cottons is published.

Tests on mode of ginning in relation to the yarn neppiness.—Neppiness in cotton has always been a source of considerable trouble to the industry and the problem of its origin has been attacked from different angles from time to time. It will be remembered that a microscopic examination of the cotton hairs was undertaken with the object of finding out any possible relationship between the neppiness of a cotton and maturity count. In order to supplement this work, it was regarded necessary to perform spinning tests on samples of the same cotton ginned in a roller gin and a saw gin. Two small gins for this purpose were acquired for the Laboratory. These are now being erected, and the experiments in connection with this work are being undertaken on the following cottons for which sufficient quantity of *kapas* has been obtained :—

Gadag 1, Jayawant, Banilla, Verum (Nagpur), Punjab-American 289F, Sind-American 285F, Surat 1027 A.L.F., and Cambodia Co.1.

The tests will include an examination of the effects of roller speeds and breast-plate settings so that along with the main problem information may also be made available as to the speeds and settings which are most suitable for ginning different varieties of Indian cotton.

Carding problems.—The extensive investigation on the effect of different settings of the card on the quality of yarns spun is in progress. Alongside of tests on the strength, extension, irregularity, etc., of yarns, a large number of tests are being made on representative samples of fibres obtained from the flat strips, sliver, fly, etc., with each setting. This work is in progress.

II. RESEARCH LABORATORY.

Fibre Testing Section.—Members of the staff deputed to this section have been kept fully occupied with the testing of agricultural samples for their fibre-properties. As is well known, these tests consist of determination of mean fibre-length by two independent methods, fibre-length distribution and fibre-weight per inch for the non-standard cottons and additional tests on fibre-strength, fibre-rigidity, convolutions, and ribbon-width for the standard cottons. In addition to these, numerous tests have been made on samples obtained from card slivers, flat strips and fly in connection with the technological work on carding problems, to which a reference has been made above, and on carded and combed slivers in connection with the work on the combing of good-quality Indian cottons. Furthermore, a fairly large number

of tests have also been made on small size samples received for fibre tests only from different sources. The following statement shows the samples tested for fibre-properties only together with the names of the officers by whom these were submitted :—

(1) *The Director of Agriculture, Baroda State, Baroda.*—One sample of Kadio (Amereli) cotton.

(2) *The Cotton Breeder, South Gujarat, Surat.*—3 samples of cross strains.

(3) *The Cotton Research Botanist, Parbhani, Hyderabad.*—10 samples of Gaorani, 2 samples of Parbhani 21 and Havri 3, 2 samples of Hyderabad-American and 5 samples of Hyderabad-Egyptian cottons.

(4) *The Assistant Botanist, Hiriyur, Mysore State.*—One sample of *G. Arboreum* x *G. Herbaceum* (149-152) strain.

(5) *The Bharatkhand Textile Manufacturing Co., Ltd., Ahmedabad.*—2 samples of Egyptian strains grown at Ahmedabad.

(6) *C. Morgan Esq., Calcutta* (through the Department of Education, Health and Lands, Simla).—4 samples of Sea Island and other cottons resembling Peruvian.

(7) *The East India Cotton Association, Ltd., Bombay.*—30 samples of A.R. Kampala, A.R. Busoga and A.R. Jinja cottons.

The total number of such samples tested for fibre-properties only during the year under review was 60, which shows a large increase over the previous year's figures for such tests. Amongst these mention must be made of the African cottons submitted by the East India Cotton Association, Ltd., Bombay. These samples are being tested with the object of enabling the Standards Committee of the Association to lay down suitable standard of length for the African cottons. As will be seen from the above statement, 30 samples of African cottons were tested up to 31st August 1932. A summary of the fibre-test results for the 1930-31 samples was placed before a meeting of the Special Appeal Committee on African Cottons appointed by the East India Cotton Association to deal with this question, and as will be seen from the following extract from a letter received from the Secretary of the Association, this body recorded its appreciation of the assistance given by the Laboratory :—

> "I am directed to inform that the Special Appeal Committee on African cottons have placed on record their sense of appreciation of the very useful and valuable services rendered by the Technological Laboratory to the Association and to convey to you their best thanks for the time and trouble you have devoted with the work of carrying out staple tests on the Uganda cotton."

At the meeting referred to above it was decided that in view of the necessity of having correct standards for these cottons, of which large quantities are imported into India, it is desirable to continue these tests for another season. Accordingly samples of fair average quality of A.R. Kampala, A.R. Busoga, and A.R. Jinja are being received and tested at the Laboratory.

A fairly large number of samples were also received for fibre-tests from the Cotton Research Botanist, H. E. H. the Nizam's Dominions, Parbhani, Hyderabad, Deccan. These included besides promising selections from Hyderabad-Gaorani, many American and Egyptian varieties which are being tried in Hyderabad (Deccan) with a view to seeing if the condition of soil and weather will be suitable for their cultivation on a large scale.

Mr. N. Hari Rao has continued to supervise the work of this section and has, in addition, made good progress in his own problem of investigating the effect of twist on the strength of cotton fibre. This work is in progress. He has also, in collaboration with Mr. C. Nanjundayya, completed an investigation on the effect of variation in humidity on the fibre-weight of different Indian cottons. In its bearing upon the spinning performance of a cotton, the fibre-weight is an extremely important property, but cotton being a highly hygroscopic substance, it is affected to a very appreciable extent by changes in the humidity of the surrounding atmosphere. It is, therefore, necessary that the variation in the fibre-weight should be accurately known under the conditions of experimentation in which cottons are usually tested at the Technological Laboratory, so that suitable corrections may be applied to values obtained at different humidities. Hitherto, the corrections applied are based upon the results obtained by Urquhart and Williams and published in the *Journal of the Textile Institute*, Vol. XVIII, T38, 1926. But as the conditions under which these authors obtained their results did not exactly conform to those ordinarily prevailing at the Technological Laboratory, it was regarded desirable to undertake this investigation at the Laboratory. This was made possible by the use of the small new Humidifier which was installed in the Laboratory last year and by means of which it was feasible to obtain any desired humidity up to 85 per cent. R. H. in the experimental room. Accordingly eight standard cottons representing different types and Provinces were selected and the variation in the weight of their fibres was studied at different humidities ranging from 30 per cent. R. H. to 85 per cent. R. H. Some of this work needs repetition, and as soon as the results of these repeat tests are available, they will be published in a Technological Bulletin.

Physics Section.—In collaboration with Mr. R. P. Richardson, Mr. D. F. Kapadia is carrying on the investigation on the effect of different settings of the carding engine on the regularity of sliver, percentage of waste losses, the quality of yarns spun, etc.

Mr. R. S. Koshal completed his investigation on the variation of fibre-length, fibre-weight and fibre-strength of hairs growing on different parts of the cotton seed. The results of this investigation have been written up in

the Technological Bulletin, Series B, No. 14, which has been published in the *Journal of the Textile Institute*. A summary of the bulletin will be found under " Publications."

Mr. Srinagabushana has also completed his investigation on the variation in rigidity, number of convolutions and ribbon-width of cotton hairs growing on different parts of the seed. This work forms a supplement to the work done by Mr. Koshal and, taken together, they constitute a thorough examination of the asymmetry which was found to exist in the properties of cotton fibres growing on different parts of the seed. Owing to the fact that Mr. Srinagabushana had to leave the Laboratory to take up his new appointment as Technological Assistant at Surat, he has not been able to write up an account of his work. As soon as this is written, it will also be published in the form of a Technological Bulletin.

Mr. C. Nanjundayya.—It has been mentioned above that in collaboration with Mr. Hari Rao, Mr. C. Nanjundayya devoted part of his time during the period under review to studying the variation in the fibre-weight of cotton fibre with changing humidity. He has also continued his investigation on the variation in fibre-strength with length-grade of cotton fibre, but this investigation was suspended for some time in favour of another problem which has been engaging the attention of Mr. Nanjundayya and the writer. This problem relates to the development of a new method of measuring the mean fibre-length and fibre-weight of a cotton. As is well known, these two properties taken together constitute the most important link between the spinning performance of a cotton and its fibre properties. They are at present determined by methods which are capable of giving fairly accurate results but which require considerable time for their determination. The method which is being evolved at the Technological Laboratory aims at a determination of these two properties in a single operation, the results being of the same order of accuracy as obtained at present with the old methods but the duration of experiment being greatly reduced. The preliminary tests on this new method have given encouraging results and an apparatus is now under construction, by means of which it is intended to make the final trials.

Mr. Ram Narayan Mathur, who was appointed Temporary Junior Research Assistant on 27th May 1932, has been engaged on a detailed study of the ribbon-width of cotton hair with a view to finding any possible relationship between this property and the fibre-weight of the cotton tested. Ordinarily ribbon-width is measured by placing the fibres between two slides under a microscope; but, as these measurements are only taken in one plane and as the cross-section of the fibre is anything but circular at most places, it was felt that additional light on the subject would be thrown if the ribbon-width were measured in two planes perpendicular to one another. Accordingly an apparatus was designed by means of which it was possible to rotate the fibre through any angle without removing it from under the microscope. Mr. Mathur has completed his investigation on five cottons and the work is in progress.

Chemistry Section.—In order to complete the investigation on the asymmetry of properties of fibre growing on different parts of the seed, Mr. D. L. Sen has been engaged in the chemical analysis of the seed-coat and the kernel of the two halves of the seed. The results of these experiments, taken in conjunction with Mr. Sen's previous results, on the chemical analysis of the fibres growing on different parts of the seed are very interesting but in the present stage of our knowledge somewhat difficult to explain. Further work on this problem is under contemplation in order to remove the anomalies which are found to exist as between the wax content and ash content of the fibres on the one hand and of the seed-coat and the kernel on the other.

Mr. Sen has also been engaged on the determination of the moisture content of samples drawn from fully pressed bales of cotton as they are ordinarily received in Bombay. A report on this work is given under the heading " Moisture Testing Section."

It will be remembered that some experiments were performed at the Laboratory in 1929 in connection with the spontaneous combustion of cotton. These experiments were mostly on loose cotton and gunny-bag material. It was felt that in order to extend the work which had already been done fresh experiments should be undertaken on small bales pressed approximately to the same density as the commercial bales so as to examine the behaviour of cotton as regards spontaneous combustion under conditions which are ordinarily found to prevail in the godowns. For this purpose, small hard-pressed bales were prepared from clean, dirty and dry and damp cotton. In some of these bales the lint was impregnated with 10-15 per cent. water and half per cent. unsaturated vegetable oils. Previous experiments had shown that the co-existence of water and cotton would result in the production of inflammable gases and it was thought that perhaps the presence of unsaturated oils might start spontaneous combustion as a result of the evolution of sufficient quantities of heat on the rapid oxidation of the unsaturated oils. In this manner extremely favourable conditions for spontaneous ignition were provided in these small hard-pressed bales. These bales were kept in the sun for nearly five months and a record of the daily maximum temperature was maintained, but the experiment yielded negative results as none of the bales showed any sign of spontaneous combustion throughout this period.

Microscopy Section.—Mr. Gulati has completed the re-determination, by the improved method, of the percentage of mature hairs in 31 cottons selected in connection with the problem of neppiness in cotton. This work has given rise to another subsidiary problem, *viz.*, the objective determination of the number of neps in a yarn. The present method of counting the number of neps in a given length of yarn is not entirely satisfactory as it is subject, to some extent, to personal errors. In order to reduce the personal element to a minimum, a method is being developed by which it is hoped it would be possible to count the number of neps with at least as much accuracy as is obtained in the maturity count tests. This problem bristles

with difficulties as the instruments which have so far been designed and tried have partially failed to distinguish between proper neps and yarn irregularity. Work on this line is in progress.

In addition to these two investigations, Mr. Gulati has carried out a number of maturity tests on agricultural samples for which the demand seems to be expanding. Many cotton breeders now are not satisfied merely with the fibre-length and fibre-weight per inch of their cottons, especially in such cases where these are to be used as parents in hybrids, but require more detailed knowledge of the fibre-properties of their samples. All the work in connection with the testing of such samples is being done by Mr. Gulati in the Microscopy Section.

III. MOISTURE TESTING SECTION.

It will be recalled that last year experiments were conducted on the determination of moisture content of samples drawn from bales pressed under known conditions of humidity. In order to supplement this work and to meet the possible objection that the conditions under which these special bales were pressed did not conform to those obtained for the ordinary commercial bales, it was decided to extend this work by determining the moisture content of samples drawn from commercial bales as they are ordinarily received and stored in the Bombay godowns. The East India Cotton Association was asked to provide facilities in the matter of drawing samples and it very kindly agreed to do so. During the period under review 97 samples were tested in connection with this second series of tests. Preliminary reports describing the principal conclusions derived from the results of both series of tests were placed before the Moisture Tests Sub-Committee of the East India Cotton Association. After very careful consideration it was decided that, owing to the importance to the trade of these tests and the very interesting results especially with regard to the low moisture content of many of the Indian cottons which have emerged as a result of this work, these tests should be continued next year. The East India Cotton Association, furthermore, placed on record its appreciation of the work done by the Technological Laboratory in connection with the determination of moisture content of bales of Indian cottons as will be seen from the following letter received from the Secretary of the Association :—

"I am directed to inform you that the Moisture Tests Sub-Committee appointed by the Board of Directors of my Association have placed on record their sense of appreciation of the very useful work done by the Technological Laboratory, and, especially, by you in connection with the experimental tests with a view to ascertaining the normal moisture content in cotton bales which have proved to be of considerable help both to the cotton trade and cotton industry and to convey to you their best thanks for the time you have devoted and the trouble you have taken in the work of carrying out such tests."

The other investigation on the variation in the weight of bales under different conditions of humidity has now been completed and its results are in the course of being written up in the form of a bulletin. When this bulletin is published the question of issuing another bulletin embodying the results of tests on specially pressed and commercial bales will be considered.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins and Circulars issued during the period under review :—

I. Technological Bulletins, Series A, Nos. 19-20 and 21.

(1) Series A, No. 19, March 1932, Application of Different Systems of High Draft Spinning to the Mixings of Indian Cottons, by R. P. Richardson, F.T.I., and Nazir Ahmad, M.Sc., Ph.D.

(2) Series A, No. 20, April 1932, Spinning Tests on Mixings of Long-staple and Short-staple Indian Cottons, by Nazir Ahmad, M.Sc., Ph.D.

(3) Series A, No. 21, July 1932, Reports on Standard Indian Cottons, 1932, by Nazir Ahmad, M.Sc., Ph.D.

II. Technological Bulletins, Series B, No. 14, May 1932, "Variation in the Properties of Cotton Fibre in relation to its position on the Surface of the Seed," by R. S. Koshal, M.Sc., and Nazir Ahmad, M.Sc., Ph.D.

III. Technological Circulars, Nos. 59-80, as under :—

Circular No.	Cottons.	Date of publication.
59	Kadi-Viramgam and Tinnevelly, 1930-31	August 1931.
60	Dhulia (Khandesh), 1931-32	December 1931.
61	Umri Bani, 1931-32	January 1932.
62	Verum 262 (Akola), 1931-32	January 1932.
63	Ujjain cottons, 1931-32	February 1932.
64	Khandesh cottons, 1931-32	February 1932.
65	Verum 262 (Nagpur)	February 1932.
66	Punjab-American 289F, 1931-32	February 1932.
67	Punjab-American 4F, 1931-32	February 1932.
68	Jaywant (Kumpta), 1931-32	April 1932.
69	Broach (Salar), Bailhongal, and Hubli-Kumpta cottons, 1931-32	May 1932.
70	Jagadia and Kadi cottons, 1931-32	May 1932.
71	Hubli-Kumpta and Hubli-Upland cottons, 1931-32	May 1932.
72	C. P. No. 1, Muttia and Berar cottons, 1931-32	May 1932.
73	Latur and Nanded cottons, 1931-32	May 1932.
74	Surat and Broach cottons, 1931-32	June 1932.
75	Punjab-American, Jagadia Farm and Navsari cottons, 1931-32	June 1932.
76	Dhollera, Westerns, Farm Westerns and Kumpta cottons, 1931-32	July 1932.
77	Bijapur and Tinnevelly cottons, 1931-32	July 1932.
78	Upland, Cambodia and Karunganni cottons, 1931-32	July 1932.
79	Kadi-Viramgam and Khandesh cottons, 1931-32	August 1932.
80	Kalagin and Bagalkote cottons, 1931-32	August 1932.

Reference has already been made to new features of Technological Reports on Standard Indian Cottons, 1932; the following are the summaries of the other bulletins :—

(1) *Series A, No.* 19, *Applications of Different Systems of High Draft Spinning to Mixings of Indian Cottons.*—This bulletin describes the results of tests carried out on mixings of two Indian cottons, using three different systems of high draft spinning and the ordinary system. This investigation is in continuation of the preliminary tests already made in this Laboratory and reported upon in Technological Bulletin, Series A, No. 15. The high draft systems have been called System A, System B and System C, of which Systems A and B are the same as were used in the preliminary tests. A short description of the mechanical construction of each system is given in this bulletin.

The subject is introduced by a short discussion on the principal causes responsible for producing irregularity in the structure of yarn, and the part played by the physical and chemical properties of a cotton during the process of drafting. As a result of this discussion it is shown that cottons possessing long and fine fibres are capable of withstanding the disturbing effects of long drafts to a much greater extent than those possessing short and coarse fibres.

The experimental work involved 7,560 lea tests, 8,160 tests for ballistic work of rupture, 5,600 tests for twist, and examination of yarns for evenness and neppiness. The results are presented in the form of tables from which the following conclusions are drawn :—

(1) Of the three high draft systems, System C gave comparatively few breakages with both twist multipliers (4.0 and 4.5), System A, few with the lower but rather too many with the higher, while System B gave most breakages with both; of the three modes of spinning on the ordinary system the tape drive arrangement gave fewer breakages with the lower twist but more with the higher as compared with the band drive arrangement, while spinning from double roving, double draft, suffered from the highest number of breakages. The various systems have been arranged in a table of merit with yarn-breakages in the ring frame as criterion.

(2) Within the range of cottons and machinery used in these experiments, twist as an aid for reducing yarn-breakages in the ring frame is most effective when short-staple cottons are spun on the ordinary system, and least so when comparatively long-staple cottons are spun on any of the three high draft systems.

(3) There is a large decrease in the number of yarn breakages as the quality of mixing improves. This shows one of the advantages of using a mixing of a good quality, as with fewer breakages, the number of ring piecers required to look after the frames would be correspondingly less.

(4) There is no apparent relationship between count and number of neps per yard-length of yarn, nor does the mode of spinning make any appreciable difference to the latter.

(5) Almost invariably yarns spun on the high draft systems are more even than those spun on the ordinary system. Among the latter, spinning from double roving, double draft, gave decidedly the most uneven yarns while the ring frame with tape-driven spindles gave on the whole more even yarns than the other. The different systems have been assigned suitable places in a table of merit with yarn evenness as criterion.

(6) In every case, the three high draft systems have given stronger yarns than the ordinary system. This at once suggests two economically advantageous ways of employing a high draft system, (*i*) using mixings of an inferior quality but obtaining yarns of the same quality as with the ordinary system ; (*ii*) using mixings of the same quality but obtaining yarns of superior quality.

(7) The ring frame with tape-driven spindles gave better results in each case than the one with band-driven spindles. Since in all other respects the two ring frames were identical, this is attributed to less slippage and more uniform tension in the case of the former. This conclusion is applied to high draft system C which, contrary to high draft system A, was also fitted with tape drive arrangement.

(8) Double roving, double draft, gave weaker yarns with coarser mixings but stronger yarns with finer mixings as compared with single roving, ordinary draft. The theoretical implications of this result are discussed.

(9) Yarns spun from intermediate roving on high draft systems A, B and C do not come up to the level of those spun from double hank roving on the same systems, but they compare very favourably indeed with those spun on the ordinary system, especially when spindles of the latter are hand-driven. This shows a third way of using a high draft system which would reduce costs as compared with the ordinary system. One of the processes (in the present tests processing on the roving frame) may be completely eliminated without appreciably reducing the quality of yarn, thereby effecting considerable saving in initial outlay, labour charges, running expenses, etc. Alternatively, fewer preparations may be made, keeping some of the spindles in each process idle, and yarn may be spun from a coarser hank roving. The adoption of any one method out of these four must be left to the individual discretion of the mill going in for high draft spinning.

Taking all the results into consideration a table of merit showing the relative performance of the high draft systems and the ordinary system with lea strength of yarns as criterion has been prepared.

(10) The percentage difference in breaking strength of yarns spun on a high draft system and the ordinary system diminishes rapidly as the quality of mixing improves. This is explained in terms of the specific action of the mechanism of a high draft system on the short fibre present in a mixing.

(11) Increase in yarn strength produced by inserting higher twist is greatest when short cottons are spun on the ordinary system. Coupling this with the observation made above that twist is most effective in reducing yarn breakages in the ring frame under similar conditions, we conclude that the binding effect of twist on fibres is most pronounced when short cottons are spun on the ordinary system.

(12) For the special benefit of practical men a table has been prepared which shows the corrected lea strength values, for all the mixings, spun into suitable counts, on the different systems of spinning employed in these tests.

(II) *Series A, No.* 20, *Spinning Tests on Mixings of Long-staple and Short-staple Indian Cottons.*—This bulletin describes the results of tests on mixings of long-staple and short-staple Indian cottons performed with the object of gauging the harmful effects of adulterating quality cottons with poor types. It is found that in every case, such a practice impairs the quality of yarn, even when the proportion of the short-staple cotton is relatively small. The number of yarn breakages in the ring frame mounts up, yarns become progressively less even and in one case (4F and Mollisoni) are found to be considerably neppier than those spun from either of the two pure cottons.

The diminution in yarn strength, in some cases, is phenomenal. Karunganni, which in the pure unadulterated state will yield a good 20's warp, is found suitable for no more than 12's standard warp counts, when mixed with 25 to 30 per cent. of the short-staple Pulichai cotton. It is further found that if the fibre-properties of the short-staple variety differ considerably from those of the long-staple variety, the diminution in yarn strength is both regular and continuous, so that, within a wide range of percentage composition, the spinning performance is very nearly proportional to the amount of the inferior growth present in the mixing. Such, for instance, is the case with P.A. 289F and Mollisoni. The former has a long and fine staple, while the latter is a relatively coarse and short-stapled variety. It follows that, as the percentage of Mollisoni in the mixtures is gradually increased by equal amounts at a time, the highest standard warp counts for which the mixtures are found suitable decrease in a regular manner—a decrease of three units in the latter being associated with an increase of 10 per cent. in the proportion of the former. On the other hand, when the fibre-properties of the inferior variety do not differ so radically from those of the superior variety, the spinning performance of the mixtures declines at first rapidly and afterwards slowly, as the proportion of the short-staple cotton is gradually increased. The difference in the behaviour of these

two series of mixtures has been explained quantitatively in terms of the modification of their fibre-properties. It is realized that in actual practice it is neither customary nor advisable to attempt to mix widely dissimilar cottons; nevertheless it will be found useful to bear the above two conclusions in mind in order to form a correct estimate of the spinning performance of a mixture of known composition.

The observation made above that diminution in the strength of yarns spun from a mixture of two dissimilar cottons is directly proportional to the amount of the short-staple component gives us a useful working rule which may be applied either to infer the spinning performance of a mixture of known composition or to estimate the composition of a given mixture.

(III) *Series B, No.* 14, *Variation in the Properties of Cotton Fibre in relation to its position on the surface of the seed.*—The experiments described in this bulletin relate to the following fibre-properties in relation to the position of the fibres on the surface of the seed : (*i*) fibre-length, (*ii*) fibre-weight, (*iii*) fibre-strength. The material consisted of a single seed of Surat 1027 A.L.F., and groups of 200 seeds of six Standard Indian Cottons, two of which were also tested for two seasons. The lint was obtained from the following regions of the seed—(*i*) the apex or the pointed end, (*ii*) the base or the butt end, (*iii*) the right flank, (*iv*) the left flank, (*v*) the hairs removed in gentle combing by hand—'the combed hairs.' The position of the point of rupture in a single hair break was also examined by mounting fibres between two types of eyelets, one made of brass and the other of aluminium, the former always attached to the basal position and the latter to the apical position of the fibre.

From the study of the graphs and the analysis of the test results the following conclusions have been drawn :—

(1) The frequency distribution of fibre-length is approximately symmetrical and normal not only for fibres taken from the whole seed but also for fibres taken from different regions of the seed.

(2) The mean fibre-length for fibres at the base of the seed is significantly greater than for fibres at the apex of the seed, indicating that the basal fibres are longer than the apical ones.

(3) Not only is the asymmetrical distribution of fibre-strength a characteristic of all fibres from the seed, but also, in the different regions of the seed, the distribution of fibre-strength is definitely skew.

(4) The mean fibre-weight per unit length and the mean fibre-strength are significantly higher for the apical than for the basal fibres.

(5) The values of the mean fibre-length, the fibre-length distribution, fibre-weight, and fibre-strength are practically the same for the right and

the left flanks,—the small differences observed between them are well within the sampling error.

(6) The fibres which are removed in the process of combing the seed by hand are generally those which have got the least fibre-weight.

(7) For the majority of fibres (about 80 per cent.) the point of rupture in single hair breaks is located in the *apical point* of the fibre. There is a low correlation between the point of break and strength, indicating that there is a tendency for the comparatively weak fibres to break near their apical ends.

(8) The percentage differences between base and apex mean values of the various fibre-properties are different for different cottons.

(9) There is a distinct tendency for a high ginning percentage to be associated with low percentage difference between mean fibre-length of hairs taken from the apex and base of a seed.

The practical applications of this investigation are discussed in Section VII. It is pointed out that in selecting new strains the cotton breeder should pay attention not only to the absolute values of the fibre-properties, but also to the percentage difference between the mean values of the properties of hairs growing on the base and the apex of the seed. An analysis on these lines will at once differentiate between two strains with respect to the regularity of their staple, thus enabling the breeder to select the particular strain which will yield a more uniform lint. Secondly, on account of the large differences in the base and apex mean values of some cottons, it is suggested that if a method of differential ginning could be devised which would remove the lint from the two flanks and the base of the seed separate from that on its apex, it would be possible to obtain from the same seed two lots of cotton, one lot being appreciably longer and finer than the other. Such a differential gin would act as a combined ginning and combing machine. The suggestion is made for the benefit of those who have a mechanical bend of mind. Thirdly, it is pointed out that in view of the unexpectedly large difference in the base and apex mean values of the various fibre-properties it is extremely necessary, wherever possible, to take a fairly large sample for the determination of any of the fibre-properties. Where, owing to the tedious and time-absorbing nature of the work, a fairly large sample is ruled out ; the sample selected should be so constituted as to be *thoroughly* representative of the bulk, otherwise a preponderance of basal or apical hairs in the sample will introduce a large error in the result.

V. GENERAL.

Visit of the Indian Tariff Board.—On 28th June 1932 the President and members of the Indian Tariff Board kindly paid a visit to the Laboratory. They were received by Mr. S. D. Saklatvala, Mr. P. H. Rama Reddy and

the writer, and were taken round the different sections of the Laboratory. They evinced keen interest in the work of the Laboratory and discussed in detail its theoretical and practical aspects.

Staff.—The staff of the Laboratory on 31st August 1932 was as follows :—

Director.—Nazir Ahmad, M.Sc., Ph.D.

RESEARCH LABORATORY.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc. ; Ram Saran Koshal, M.Sc.

Junior Research Assistant.—C. Nanjundayya, M.Sc.

Temporary Research Assistant.—R. N. Mathur, M.Sc.

Junior Testing Assistants.—S. S. Sukthankar, L.T.C. ; K. G. Deo ; H. B. B. Joshi, B.Sc. ; K. S. Marar, B.A., LL.B. ; R. G. Panvalkar, B.Sc.; S. Samson, B.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc. Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Draughtsman.—B. G. Mehta.

Instrument Maker.—Moreshwar M. Patke.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, F.T.I.

Senior Research Assistant—

(*Assistant Technologist*).—D. F. Kapadia, B.Sc.Tech., B.A.

Yarn Testing Section :—

Statistician.—V. Venkataraman, M.A.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—B. P. Jain; M. T. Sundaram.

Mr. R. P. Richardson, Spinning Master, proceeded on short leave, sanctioned by the Standing Finance Sub-Committee, from 4th March 1932 to 29th April 1932. During his absence on leave Mr. D. F. Kapadia officiated as Spinning Master.

Mr. R. S. Koshal was granted 7 months' study leave by the Indian Central Cotton Committee, and proceeded to England on the 2nd May 1932.

Mr. C. Nanjundayya, who was on the staff of the Laboratory as Temporary Research Assistant, was appointed Junior Research Assistant from 1st August 1932 in the place of Mr. H. N. Dutt.

Mr. Srinagabushana, who was a Temporary Research Assistant, was appointed as Technological Assistant at Gujarat, Surat, with effect from the 12th March 1932.

On account of the transfer of Mr. Srinagabushana to Surat to take up the new post and the absence of Mr. R. S. Koshal on study leave outside India, Mr. R. N. Mathur, M.Sc., was appointed a Temporary Research Assistant for a period of one year with effect from 27th May 1932.

Messrs. K. M. Samant, M.Sc., and V. S. Raghavan, B.A., were appointed Temporary Junior Testers for a period of three months with effect from 21st September 1931.

Preparation of Exhibits.—The Indian Central Cotton Committee, at its meeting held on the 13th and 14th July 1931, decided that sets of exhibits from standard Indian and certain other improved varieties of cottons should be prepared at the Technological Laboratory. One of these sets has been prepared at the request of the Imperial Council of Agricultural Research, who have decided to participate in the forthcoming World's Grain Exhibi-

tion and Conference, which is to be held in July-August 1933 at Regina, Canada. The other set has been prepared for the Directors of Agriculture who will send them to the Agricultural Fairs and Exhibitions held in the country as the occasion arises.

These two sets which consist of the following exhibits, have been prepared rom 18 standard Indian cottons and two non-standard cottons :—

(1) 6 combed seeds fixed on black cardboards ruled in inches to show the staple length of the cotton.

(2) Card sliver to show the regularity and the cleanliness of the sliver made from the cotton.

(3) *Yarn bobbins.*—4 yarn bobbins from each cotton to show the general appearance and the degree of cleanliness of yarns spun from each cotton.

(4) *Yarn knots.*—Two yarn knots from each cotton to which labels are attached showing the counts for which the cotton is suitable, the strength, the turns per inch inserted, and the front roller speed which is an indication of the production of yarn per hour.

(5) *Black winding cards.*—One for each cotton on which samples of yarns are wound to show the degree of evenness and neppiness of the yarn.

These sets will be disposed of in accordance with the decision of the Committee.

Alignment of machines.—It was mentioned in my last Annual Report that all the machines up to the Card which had been found to be somewhat out of alignment owing to the gradual sagging on the floor of the Spinning Laboratory have been properly re-set and re-aligned. This process was continued in the period under review right up to the ring frames. Consequently all the machines have now been re-aligned.

ACKNOWLEDGMENTS.

I have pleasure in acknowledging my indebtedness to the office-bearers of the Indian Central Cotton Committee for many valuable suggestions, to W. Ellis Jones, Esq., for kindly valuing test samples, to office-bearers of the East India Cotton Association, especially Mr. C. M. Parikh, for giving full facilities for experiments on the variation of moisture in bales, and to the members of the East India Cotton Association, especially Messrs. Patel Cotton Co., for kindly supplying samples for moisture tests. I have also pleasure in acknowledging the very helpful manner in which the staff of the Laboratory have carried out their arduous duties and the loyal co-operation which I have throughout received from my Office Staff.

NAZIR AHMAD,
Director, Technological Laboratory.

Dated 10th November 1932.

BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

APPENDIX I.

LIST OF RESOLUTIONS.

"The Central Cotton Committee approves in principle of the draft bill which has been introduced by a private member into the Central Provinces Legislative Council for supplying the Central Provinces with organised cotton markets on the lines of those in Berar."

"The Central Cotton Committee approves of the action taken by the Local Sub-Committee in recommending to the Madras Government less drastic legislation under the Madras Cotton Control Bill provided that the scope of the Bill is restricted to the growing of *Pulichai* cotton in the Tinnevelly area."

"That the Report of the Local Sub-Committee on pools of cotton ginning and pressing factories be adopted."

"That a sum amounting to Rs. 10,000 be provided in next year's budget for the initial expenses of an investigation into the cost of production of cotton and rotation crops."

"That the Central Cotton Committee, while being thoroughly appreciative of the work which some Provincial Cotton Committees have accomplished, feels that sufficient use is not made of these local advisory bodies and recommends that they should be more closely associated with all matters connected with grants from the Committee. The Central Cotton Committee further deplores the action of the United Provinces Government in failing to re-constitute the United Provinces Provincial Cotton Committee but trusts this will last only for the period of the financial stringency."

"That Directors of Agriculture and others responsible for the preparation of cotton forecasts be asked to continue their co-operation in investigating the discrepancies pointed out in the Secretary's note between the forecasted crop and the press returns in the Provinces and Indian States with a view to obtaining greater accuracy in the cotton forecasts."

"The Central Cotton Committee desires to thank the Government of India for agreeing to its request to separate the Kathiawar States from the Gujerat Trade Block for the purpose of compiling the Raw Cotton Trade Statistics."

"The Central Cotton Committee has read with considerable pleasure the first report on the working of the Dhulia Cotton Market and suggests to the Bombay Government that a copy should be sent to every District Local Board and Municipality in the Presidency interested in cotton with a view to acquainting them with the successful establishment of a market run in the interests of the grower."

"The Central Cotton Committee wishes to denounce the proposal passed by the Bombay Municipal Corporation to impose a cess of four annas per bale on all cotton exported from Bombay, as this cess will fall on the grower who will receive less for his produce. The Central Cotton Committee trusts the Bombay Government will refuse sanction to the proposal in the interests not only of the growers in the Presidency but of those in other parts of India."

"The Indian Central Cotton Committee thanks the Bombay Government for acceding to its request by sending copies of the first report on the working of the Dhulia Cotton Market to all District Local Boards and Municipalities. The results already achieved are encouraging and the Committee trusts that the spread of the knowledge of the benefits of regulated markets will lead to the establishment of a larger number of such markets in the near future."

" The Indian Central Cotton Committee wishes to express its appreciation of the interest shown by the Indore Darbar in connection with the regulation of cotton markets in the State and trusts that its efforts in this direction will have the desired effect of securing better prices to the grower of cotton."

" That a copy of the previous discussion on this subject be circulated to all commercial and agricultural bodies interested in cotton and to the Government of India and that the matter should be brought up at the next meeting of the Committee for further discussion and final decision."

" The Indian Central Cotton Committee thanks the Madras Government for the opportunity afforded to it of expressing its views on the Madras Cotton Control Bill and for giving effect to its recommendations by incorporating the necessary amendments in the Bill."

" That before this memorandum* was compiled the Local Sub-Committee should invite all the members to send an expression of their views with their reasons therefor and the Secretary, who would then finally collect all the information, should put them before the Local Sub-Committee."

" That the Government of India be requested to arrange for separate trade statistics for loose cotton for such trade blocks as, in the opinion of the provincial authorities responsible for the compilation of cotton forecasts, are of importance for their purposes."

" That the Indian Central Cotton Committee approves of the future policy and programme of research work of the Institute of Plant Industry, Indore, as laid down in the Report submitted by the Director, subject to the amendment proposed by Mr. Collins."

" That the Indian Central Cotton Committee approves the action of the Standing Finance Sub-Committee in appointing Rao Bahadur Bhimbhai Ranchodji Naik on the Advisory Board of the Imperial Council of Agricultural Research *vice* Mr. S. D. Saklatvala resigned."

" The Indian Central Cotton Committee has read with great interest the proceedings of the Central Provinces, Sind and Punjab Cotton Committees and trusts that the good work that is being done by these bodies will be of permanent value to the cotton industry of the provinces concerned."

" That the next cold weather meeting of the Committee be held in Sind."

" That Rao Bahadur Bhimbhai Ranchodji Naik and Mr. M. P. Kolhe be appointed to represent the growers' interests on the Board of the East India Cotton Association."

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* Memorandum on the proposed compilation and publication of All-India Cotton Forecasts by the Committee.

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the year ended June 30th, 1932.

1. *Introduction.*—The Institute of Plant Industry is a Society registered under the Holkar State Societies Act, and its primary objects are :—

(*a*) The investigation of all matters relating to the production and improvement of raw cotton in India.

(*b*) The agricultural development of the territories of the Princes and Chiefs under the Suzerainty of His Majesty exercised through the Governor-General of India or through any Governor or other officer subordinate to the Governor-General of India who shall be members of the Society.

(*c*) The training of officers and cultivators nominated by such Princes and Chiefs.

(*d*) The training of advanced students nominated by the Indian Central Cotton Committee.

Its funds are derived entirely from subscriptions; the Indian Central Cotton Committee has made annual grants varying from Rs. 85,000 to Rs. 1,15,000 and the member-States of Central India and Rajputana subscribe another Rs. 47,000 yearly. The Cotton Committee is, naturally, most closely interested with the fulfilment of objects (*a*) and (*d*), and in fact has spent more upon the Institute than upon any other of the schemes which they have supported; their total annual subscriptions now amounting to Rs. 7,46,000 and their donations for capital outlay to Rs. 2,83,500. Their special interest, however, has not led to unconcern for the other side of the work and it is fully realized that each is complementary to the other and in no sense antagonistic.

The Governing Body of the Institute is representative of the Cotton Committee and the member-States and its President is *ex-officio* the Agent to the Governor-General in Central India. The Director of the Institute is also Agricultural Adviser to States in Central India and Rajputana, and in addition represents all those States upon the Indian Central Cotton Committee.

This constitution has proved itself admirably suited to the needs of a research station and centre for agricultural development; administration is made smooth and efficient, while financial control and purity is ensured through detailed budget estimates and quarterly audits by a firm of Chartered Accountants. The elasticity of a commercial undertaking is thus gained in large measure with a great resultant increase in efficiency.

2. *Meetings, General and Board of Governors.*—A general meeting of the Society was held at the Institute on February 11th, 1932. Several Rules and Regulations were amended to suit changed conditions, notably with regard to representation on the Board of Governors. The Board was increased from 7 to 11 members and an electoral principle for States representation was laid down. The Board of Governors met on the following day.

3. *States contributing as Members of the Institute.*—At the closing date of this report the following twenty States were members of the Institute, arranged in order of joining :—

CENTRAL INDIA AND RAJPUTANA.

Indore.	Dewas, S. B.	Barwani.	Bundi.
Dhar.	Sitamau.	Jhalawar.	Partabgarh.
Jaora.	Narsingarh.	Bikaner.	Bagli.
Datia.	Tonk.	Rewa.	Orchha.
Rutlam.	Bijawar.	Jaipur.	Bharatpur.

A number of other important States are considering joining but the existing financial stringency in all quarters causes much hesitation over any new expenditure, however desirable.

4. *Staff and Students.*—The Directorship of the Institute, vacant through the retirement of Mr. Albert Howard, C.I.E., M.A., had been filled by the appointment of Mr. F. K. Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.), formerly Director of Research in the Department of Agriculture, Iraq, who took up his duties on July 21st, 1931.

Two new posts have been sanctioned by the Board of Governors, one for a thoroughly well qualified Geneticist and Botanist, in order that research work, especially on cotton, may be expanded, the other for an Extension Officer to devote his whole energies to the development of agriculture in the contributing States.

The Indian Central Cotton Committee, having awarded a scholarship of Rs. 100 per month for research training in Plant Breeding and Cytology, posted the holder to the Institute for the year under report.

The Irwin Scholarship fund (Rs. 4,000) donated to the Institute on July 29th, 1928, by Sir Sarupchandji Hukamchand, was exhausted during the year.

From Institute funds four Research Studentships carrying honoraria of Rs. 50 per month were created to enable young men of good qualification to obtain training in research work, preference being given to those nominated by or associated with the contributing States. These studentships are proving of advantage both to the Institute and the holders. A list of the staff and research students on June 30th, 1932, is given on page 77.

5. *Visitors.*—The following list of visitors during the year indicates the wide interest taken in the Institute, not only by its direct supporters but by others :—

Apji Amarsingh of Koela, Kotah State, Rajputana.
Rai Sahib R. L. Batra, P.C.S., B.A., LL.B., Revenue Member, Bharatpur.
Seth Bhanwar Lal Sethi of Messrs. Binod Ram Balchand, Bankers, Indore.
Raj Kumar Chatterje, Esq., B.A., Bar-at-Law, Dewan, Banswara State, Rajputana.
F. C. Coventry, Esq., Dewan, Partabgarh State, Rajputana.
M. H. Crofton, Esq., I.C.S., Excise Commissioner, Central India, Indore.
Rao Bahadur Col. Thakur Devisingh of Chitore, Jaipur State, Rajputana.
Major M. V. Deolekar, Private Secretary to H. H. the Maharaja of Dewas, S.B., Central India.
G. T. Dyer, Esq., C.I.E., I.C.S., Revenue Member and President of Council, Bhopal State, C. I.
Sir Reginald Glancy, K.C.I.E., Member, Indian States Inquiry Committee.
Duncan Hall, Esq., Secretary, League of Nations, Geneva, Switzerland.
Rao Bahadur H. N. Gosalia, M.A., LL.B., Dewan and President, State Council, Barwani, C.I.
Munshi Himmat Singh K. Maheshwari, M.A., Revenue Member, Jodhpur State, Rajputana.
Major-General Hutchinson, Member, Indian States Inquiry Committee.
Sahibzada Ismail Ali Khan of Tonk State, Rajputana.
Apji Kalyansingh of Koela, Kotah State, Rajputana.
Rao Saheb N. A. Kathavate, B.A., Member of Council, Narsingarh State, C. I.
Sir Joseph A. Kay, Vice-President, Indian Central Cotton Committee, Bombay.
Dr. B. A. Keen, Director, Imperial Institute of Agricultural Research, Pusa, Bihar, and Assistant Director, Rothamsted Experimental Station, England.
Mr. Patrick, Secretary, Indian States Inquiry Committee.
Maharaj Kumar Lokendra Singh of Manipur State, Assam.
Kumars of the Daly College, Indore, C. I.
Kumars of the Mayo College, Ajmer, Rajputana.
His Highness the Maharawat of Partabgarh State, Rajputana.
Rao Bahadur Mansingh of Barwara, Jaipur State, Rajputana.

Lala Mulk Raj, Chief Revenue Officer, Dhar State, C. I.
Sahibzada Mahmud Ali Khan, Dewan, Baoni State, C.I.
Pandit Nand Kishore Chaturvedi, M.A., LL.B., Deputy Commissioner, Rewa State, C.I.
Dewan Bahadur Sardar Pandit Narayan Prasad of Dewas State (Senior), C. I.
Maharaj Kumar Narindra Singh, Heir-Apparent, Panna State, C. I.
N. Lal Singh, Esq., Chief Revenue Officer, Sitamau State, C. I.
The Hon'ble Lieut.-Col. G. D. Ogilvie, C.S.I., C.I.E., Agent to the Governor-General in Central India, Indore.
K. Raghubir Singh, B.A., Guardian-Tutor to H. H. the Minor Rana of Barwani State, C. I.
J. H. Ritchie, Esq., M.A., B.Sc., I.A.S., Secretary, Indian Central Cotton Committee, Bombay.
Sir James Roberts, K.C.I.E., I.M.S. (Retd.).
Khan Bahadur Sahibzada Sarfraz Ali Khan, Chief Secretary, Jaora State, C. I.
Rao Bahadur Sahasrebudhe, M.Sc., Agricultural Chemist to Government, Bombay.
Thakur Sajjan Singh, Chief of Bagli, Gwalior State.
Khan Bahadur Syed Shaukat Ali, B.A., Dewan, Rajgarh State, C. I.
E. F. Sykes, Esq., Member, Legislative Assembly, Delhi; Bundi Agricultural Syndicate, Bundi State, Rajputana.
Rao Saheb B. P. Vagholker, Deputy Director of Agriculture, Poona, S. C. D.
Khan Bahadur D. F. Vakil, B.A., Dewan, Rutlam State, C. I.
Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, Delhi.
The Heir-Apparent of Khilchipur State, C. I.

6. *Library.*—The Library continues to grow in usefulness, over 500 additions having been made during the year. It now contains nearly 3,500 text-books, reference books and volumes of periodicals, an author-catalogue of which has been prepared. Subject indexing and binding of the whole library is proceeding. Presentations include a large quantity of reprints and memoirs from Mr. A. Howard, C.I.E., M.A., the late Director of the Institute, and from the Imperial Institute, London, a set of its Bulletins from 1903 to date.

Over 200 books were sold during the year and 790 remain in stock.

Research Work.

7. *Organization.*—Some separation of agricultural research into subjects is necessary for clarity but this should not cloud the fact that most "subjects" are closely intermeshed with each other in the general economy of agriculture. It is impossible, for example, to study fully a crop such as cotton without touching other "subjects" whether they be other crops or "separate sciences."

The growth of knowledge of agricultural science has been so rapid and has already reached such a huge sum total that some system of specialisation has been inevitable as well in academic education and training as in research work. No one man could possibly examine all sides of a problem intensively. A great danger lies in this—the development, probably unconsciously, of a series of water-tight compartments, Chemistry, Physics, Plant Breeding, Entomology, Mycology, etc., ignoring the essential inter-dependence and interactions of the phenomena dealt with in these water-tight compartments. The cynical yet apt definition of a specialist as "one who knows more and more about less and less" is a warning against this danger. In the absence of a supply of research workers possessing a degree of omniscience not usually found in mankind, the best hope of solving agricultural problems seems to lie in concerting the efforts of several workers, each approaching the objective at his own angle, yet being aware of his fellows' advances and routes. It is hoped more and more to apply this strategic system to the research work at the Institute.

8. *Weather, effects on crops.*—The monsoon broke on June 13th and resulted in a total rainfall at Indore of 42.8 inches, the annual average being a little over 30 inches. From June 27th to September 6th, 73 days, rain fell on 62 days, the dry intervals being all of one day only except for a single four-day dry period. After a dry spell of 12 days there were 25 days of rainfall during a second period of 29 days. The rainfall was thus abnor-

mally continuous ; even the surface soil had no chance to dry out and the resultant excessive development of the typical colloidal " blanket," impervious to air, was disastrous to cotton especially on the heavier types of the black cotton soil of the Malwa plateau. Other crops suffered more or less according to the ability of their root systems to withstand the lack of soil aeration. On light land and especially in Rajputana rainfall and crops were more normal, though a downpour in October did harm. The winter was mild with subnormal rainfall, which reduced yields of *rabi* crops.

9. *Cotton.*—(*i*) Improvement of variety. (*ii*) Physiology.

(*i*) *The creation of a pure and improved barani cotton for the Malwa plateau* is an important part of the programme. In 1931 for the first time a replicated-plot yield test was laid down for ten of the pure-line selections of Malvi cotton (*G. neglectum Malvensis*), indigenous on the plateau. The selections had been made mainly for lint-length and ginning percentage but yield had not previously been tested. There was scarcely any significant difference in yield between any of the selections and the " control " which was a mass-selected Malvi mixture containing very few Roseum or other impurities. The lay-out design of this test, however, was not ideal and the results must be accepted with caution but it is satisfactory that the improvement achieved in staple and quality does not appear to have reduced the yielding capacity. Samples of these selections and the control have been sent to the Indian Central Cotton Committee's Technological Laboratory, Matunga, for examination.

The question of a *variety for well-irrigated land in Malwa* does not seem likely to be solved by selection among Malvensis types which do not give such response to irrigation and intensive cultivation as do American cottons such as Cambodia. This is unfortunate as it involves, at present, two varieties being grown in the same area and the Americans are specially susceptible to injury from the deterioration of the black soils during the rains. Some Cambodia selections made at Indore are under examination ; these show degrees of resistance to such injury.

A number of *varieties of cotton for Rajputana* were tried in single plots in Jaipur, Bikaner*, Bharatpur and Jhalawar States to gain information on general behaviour in those soils and climates.

The Botanical survey of cottons grown in India was continued and the examination of root-systems of the varieties on hand was completed. Seed of further varieties has been obtained from various Agricultural Departments, bringing the total collection up to 98.

A new piece of research work was begun in the autumn of 1931—*the effects of X-radiation of cotton seed, buds and pollen upon subsequent generations.* Remarkable mutations have been obtained by other workers, in cotton and other plants but little seems to have been done with a direct economic aim. A number of exposures were made at the King Edward Hospital, Indore, by the courtesy of its Director. Irradiated material has also been prepared for cytological examination.

(*ii*) Under the heading " *Physiology* " most of the work has been done upon the *relationship and reaction* of the cotton plant to its environment in the black soils of the Malwa plateau. In particular the soil and roots have been studied in relation to healthy and unhealthy Cambodia cotton plants, many root exposures having also been drawn to scale from plants at different stages of growth. The connection between the unhealthy conditions " red-leaf " and " leaf roll " and deterioration of black soils during the rains had been established previously. A replicated plot experiment was laid down in 1931, to discover the effects on yield, on the health of the plant and on the soil of various correctives. A specially sensitive strain of Cambodia and a mixture of six pure Malvi strains were used. The nature of sap differences in healthy and unhealthy Cambodia plants were also examined. A paper has been prepared for publication, embodying the results of much of the work mentioned above, as well as that done in the past three years.

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*Under the Gang Canal Colony cotton improvement scheme for which a special grant is made by the Indian Central Cotton Committee.

Although this investigation has been upon the relations between cotton and soil condition the results of course apply in the case of other crops in greater or less degree.

10. *Sugar-cane.*—Past work on this crop was confined to the annual growth of a small area of S. 48 variety, the cultivation being on the lines of that practised in Java. S. 48 is now rapidly displacing local varieties in Central India, wherever it has been introduced by the Institute.

No tests of other varieties were made until 1932 when a replicated randomized group experiment was planted with five varieties (S. 48, Co. 210, Co. 213, Co. 281 and Co. 290) at Indore and another similar trial of five varieties (S. 48, Co. 213, Co. 244, Co. 281 and Co. 290) on the Narsingarh State Farm, with the willing co-operation of the Darbar. An examination of cultural methods has also been begun.

The relative merits of the McGlashan, Rohilkhand and *desi gur*-boiling furnaces were thoroughly tested and the economy in fuel and labour of the first named was proved, the resultant *gur* being in no way inferior to that made on the Rohilkhand system and superior to the *desi* product.

11. *Wheat.*—Wheat is grown in Malwa, both irrigated (on a relatively small area) and as a dry land crop. In area and value it is far the most important of the *rabi* crops and is one of the two staple cereals, Juar being the other. The type grown dry is almost always a *durum* or " macaroni " wheat and it commands a premium price both for export to other parts of India and for local consumption, over *vulgare* wheat such as *Pissi*, which is also grown in a few parts. It is usually very pure.

In the *rabi* season of 1931, two replicated randomized strip experiments were laid down, with the object of finding the relative yields of six standard varieties* and the Malvi *durum*, under dry land conditions. There were only slightly significant differences in yield between any of the standard varieties but several of them were definitely superior to Malvi, notably Pusa 100 and Pusa 101.

Some *durum* and *vulgare* varieties from Egypt, Iraq, Palestine, Russia and Australia were grown in single lines for preliminary test and types were isolated from bulk seed from different localities in Central India and Rajputana.

12. *Gram.*—This probably comes next to wheat in importance as a *rabi* crop. Small quantities of some 20 varieties, which had been isolated at Pusa, were tested in lines and the most promising will be taken forward to larger scale trials next *rabi* season.

13. *Linseed.*—In many parts of Central India this is a very important *rabi* crop and selection work has been begun on local seed and among types already isolated at Pusa.

14. *Other crops.*—Initial trials of several varieties of lucerne, Soya bean, berseem, Sudan grass and barley were made.

15. *Agronomy.—The deterioration of the black cotton soils* through continuous rain, already referred to, is often a factor responsible for very great reductions in yield of cotton and other crops†. To find a method of arresting this deterioration, which the cultivator would be able to adopt, is therefore a quest of prime importance. One method is to raise the soil-content of organic matter by adding farm-yard manure, but the quantity produced on an average cultivator's holding in Malwa is insufficient for more than his limited irrigated area. He cannot afford to buy other organic manures, such as oil-cakes, and if he could the supply would not be equal to the demand. Green manuring is a possibility but the land must then lie fallow and useless while the ploughed-in crop is rotting, and though the practice is known it is little used in Malwa.

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*Pusa 4, 12, 52, 100, 101 and C. P. 115.

†In 1931 the yield of the cotton crop per acre in Malwa was generally estimated at 50 per cent. below normal due to this cause.

An increase in the production of farm-yard manure on the holding presents the easiest solution to the problem and the technique of the "*Indore compost process*"* worked out at the Institute during the last three years provides the means without cost other than the cultivators' labour. By utilizing various farm wastes and without precluding the traditional and almost inevitable use of cowdung cakes as fuel the production of manure from any holding can be doubled or trebled. The product is superior to most farm-yard manure in respect of nitrogen content, its availability and in the almost complete reduction of the waste materials to a stage which makes no call on soil nitrates to bring about further rotting. The process is already being actively adopted by large cultivators, and States are demonstrating its advantages in villages and on State farms.

Propaganda and Extension Work for States.

16. *Requirements.*—Any improvement in method or crop variety resulting from experimental work is of no utility until it is adopted by the cultivator as part of his normal practice. His financial resources and his general outlook impose serious limitations upon the sort of improvements he is able and willing to adopt and these limitations must always be kept in mind. To advocate something quite outside his reach is actually to do harm, as it impairs his confidence and destroys his interest.

Actual contact with cultivators on their land obviously cannot be maintained on any large scale by the Institute—that is, and must be, a function of the State Governments. The Institute's part is to supply information, to advocate and advise and to encourage and assist the States in every possible way.

This type of assistance can best be given by personal visits to States. During the year 33 such visits have been made by the Agricultural Adviser and 25 by the staff of the Institute including the newly-appointed Extension Officer.

17. *Instructional and training facilities.—States' officials and students.*—A number of junior or prospective agricultural employees of States has been received for periods of from one to nine months at the Institute and given general practical training. Some have come specially to learn the Indore compost process and for this *malis* and ploughmen have also been sent.

In addition a special 17-days' *Course for Revenue Officials* was held in October 1931, which 20 attended. The programme of agricultural development was explained in detail by lectures and demonstration and the enthusiastic interest shown left no doubt that Revenue Staffs can render much service by spreading information and giving friendly advice during the course of their own duties. The course received general commendation and will be held regularly in future.

The *Cultivators' Meeting*, which had been an annual feature, was held, on a somewhat diminished scale, owing to general financial stringency, in February 1932, when about 150 cultivators, including many *patels*, attended at Indore for two days, coming from seven States. Demonstrations were given to small parties at a time and in the evenings agricultural cinematograph films were shown. The scheme for a permanent camp for cultivators remains in abeyance, pending better times.

Agricultural Shows and Cattle Fairs were supported in five States; staff, exhibits and cinematograph displays being provided by the Institute and demonstrations arranged of sugar-cane cultivation, *kans* eradication, silage making, the Indore compost process, etc. A cinematograph camera and projector has been bought so that appropriate films can be prepared.

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* "The Waste Products of Agriculture, their Utilization as Humus." A. Howard, C.I.E., M.A., and Y. D. Wad, M.Sc. (Oxford University Press), gives a description of the process in simple terms and an account of the experimental work leading up to it. The book may be obtained from the Institute, price, Rs. 5.

Leaflets have been issued in English and Hindi upon lucerne cultivation and the Indore compost process (1,000 copies of these two were asked for and issued) and circular letters to States drew attention to desirable activities from time to time.

Special demonstrations were arranged, by request in several States, of the construction and use of the McGlashan *gur*-boiling furnace. Trained workers have been lent to demonstrate the Indore compost process and train others.

18. *Provision of seed, implements, etc.*—Before each sowing season every member-State was addressed, inviting the purchase for general distribution or trial of various *pure seeds of proved varieties.* Wheat, sugar-cane, lucerne, ground-nut, cotton (Cambodia and mass-selected Malvi) and some less important crops have been so distributed.

Sales of implements.—Kans eradicating ploughs, " Indore ridgers," two-row drills and levelling scoops have declined considerably during the year, as was to be expected. A stock of " Burdizzo " castrating instruments is now maintained and their use is constantly advocated so as to eliminate the use of inferior bulls. Many of the contributing States now employ these instruments.

19. *Special enquiries.*—Advice was sought upon the lay-out and working system for a sewage farm to deal with the effluent from the Jaipur city sewage works. A detailed scheme and report were provided.

Operation and experimental schemes were drawn up for State Demonstration and Experimental Farms in seven States and special Field Experiments have also been arranged and laid out on private lands in three States with the willing co-operation of the occupiers.

Other special advice has been asked for both by States and cultivators upon particular problems, and in several cases injudicious expenditure of capital was thereby averted.

By such means as the foregoing constant endeavour is made to maintain close relations with all contributing States and so to develop an atmosphere of confidence. Encouraging success has been achieved in this aim and, in spite of extreme financial difficulties in some States, not one has withdrawn from membership of the Institute.

Staff and Students of the Institute of Plant Industry, Indore, on June 30th, 1932.

Director	F. K. Jackson, N.D.A. (Hons.), Dip. Agr. (Cantab.)
Personal Assistant	Mr. A. N. Srivastava, M.Sc.
Head Clerk and Accountant ..	Mr. M. A. Shakoor, B.Com.
Second Clerk	Mr. Har Prasad.
Artist	Mr. S. R. Srinivasan Ayyar.
Librarian	Mr. Bashirhusain Khan.
Geneticist and Botanist ..	Vacant.
Senior Botanical Assistant ..	Vacant.
Plant Breeding Assistant ..	Mr. Kuber Singh, B.Ag.
Botanical Assistant	Mr. R. M. Ghose, M.Sc.
Research Student (I.C.C.C.) ..	Mr. Bhola Nath, M.Sc.
Research Student	Mr. S. R. Swarup, B.Sc. (Ag.).
Chief Assistant in Chemistry. ..	Mr. Y. D. Wad, M.A., M.Sc., A.I.I.Sc.
Chemical Assistant	Mr. V. G. Panse, B.Sc.
Research Student	Mr. Chironji Lal Nagar, B.Sc. (Ag.).
Research Student	Mr. V. N. Bhargave, B.Sc. (Ag.).
Research Student	Mr. R. K. Aurangabadkar, M.Sc.
Senior Farm Assistant	Mr. G. C. Tambe, B.Ag.
Farm Assistant	Mr. S. C. Talesara, B.Ag.
Junior Farm Assistant	Mr. G. G. Phadke, L.Ag.
Junior Farm Assistant	Mr. K. M. Simlote, B.Ag.
Fieldman	Mr. Nihal Singh.
Fieldman	Mr. V. R. Sathe.
Fieldman	Mr. E. L. Rajanna.
Storekeeper	Mr. Ishri Prasad.
Extension Officer	Mr. M. L. Saksena, L.Ag., F.I.S.C.

Programme of Research Work for the Year ending June 30th, 1933.

In this programme field experiments are classed by themselves because in many cases the problems they are intended to solve will be attacked co-operatively by workers in different sections.

For every field experiment a Scheme has been prepared on a standardized model; all details of lay-out, treatment or variety, agricultural operations and records to be maintained are included and the persons responsible for the conduct of the experiment are named.

Only what may be termed laboratory or pot-culture work is arranged under sections—chemical, plant-breeding or botanical.

Four distinct rotation types have been standardized and every field on the farm has been placed under one or other, so that after some years their relative advantages and convenience may be recognized by experience.

Field Experiments.

Experiment

1. Manurial trials, Malvi cotton (nitrogenous manures).
1a. Manurial trials, Malvi cotton (compost and farmyard manure—poor land).
1b. Manurial trials, Malvi cotton (compost and farmyard manure—rich land).
1c. Manurial trials, Malvi cotton (superphosphate as a soil deterioration corrective).
2. Control of soil moisture by surface drainage.
3. Response of Malvi cotton to irrigation.
4. Effect of associated growth of cotton and legumes.
5. Effect of Kharif legumes upon a succeeding wheat crop.
6. Comparative root activity and distribution of six legume crops and their yields of seed and straw.
7. Relative economic merits of five rotations, embodying differences in crop sequences, inclusion of legumes, compost manuring and methods of tillage.
8. The economic results of different spacings of tur (*canjanus indicus*) in a juar crop and influences on a succeeding cotton crop.
9. Juar variety trial—5 types.
10a. Comparison of Sudan grass with juar as green fodder crops, irrigated and barani.
10b. Comparison of Sudan grass and natural grass as a permanent ley.
11a. Groundnut variety trial, manured and unmanured—poor land.
11b. Groundnut variety trial, manured and unmanured—rich land.
11c. Comparison of effects of sowing whole, cracked and shelled groundnuts, soaked and dry.
12. The effect of different modes of winter ploughing (shallow eversion, deep eversion, inversion, sub-soiling) upon succeeding Kharif and other crops in a four-year rotation.
13. The effect of three methods of inter-cultivation of cotton and juar compared with hand-weeding only throughout a rotation.
14. Comparison of six different spacings in Malvi cotton.
15. Comparison of three types of Cambodia cotton, Cawnpore 9 and a Malvi type sown early on irrigation and sown on rains, irrigated later and not irrigated.
16. Soil uniformity test—
    Objects :—The estimation of natural soil uniformity.
    The same estimation as modified by grading and drainage.
    The rise of fertility due to grading and drainage.
    To discover the conditions governing the necessity of non-experimental borders in cultural trials.
    To discover the most suitable size and shape of plot for field experiments under local conditions.

17a. Yield test of Malvi cotton selections on rich land.
17b. A duplicate test on well-drained but poor land.
18. Test of comparative vigour of seed from selfed cotton selections and from a mixture of the same selections grown unselfed in 1931.
19. The effect, if any, of X-ray treatment on the vigour of a strain of Cambodia cotton highly susceptible to red leaf and leaf curl under deteriorated soil conditions.

The above 26 field experiments starting in the Kharif season are arranged on the Institute Farm with replicated plots on either the randomized block or Latin square system and involve a total of 970 unit plots.

Small-scale tests of some 90 new introductions, whether crops or varieties of crops, will be sown, usually in 2 to 4 short rows. Among the more important of such subjects are the following :—Groundnut, Soya bean, Tobacco, Tur, Jowar, Sesamum and Castor.

Chemical Section.

Soil studies.—1. Determination of properties of typical soils in Central India and Rajputana with a view ultimately to divide the region into homogeneous agricultural tracts.

2. The collection of soil profiles from the region.

3. A study of the soil of three typical fields at the Institute, embracing mechanical and chemical analysis, the movement of moisture and changes in PH values in the profile during the year and leaf sap reactions of crops growing in the soils.

4. Examination of the relative nitrifying power of some typical Malwa and Rajputana soils.

5. Investigation of the controlling influences of nitrogen supply and moisture on crops in Malwa in Field Experiments Nos. 1, 1a, 1b, 1c, 2, 3, 5, 7, 11a and 11b and the estimates (soil permeability, moisture and nitrogen content, feeding values, etc.,) associated with those experiments.

Studies on red leaf and leaf roll of Cambodia cotton, embracing investigations into composition of leaf sap and soil water.

Further developments in compost making, mainly in the directions of economy in labour and water, the investigation of the fixation of nitrogen and special adjustments of the process.

Agronomical Studies.

Cambodia cotton.—Preliminary culture tests to discover methods of controlling factors inducing a vigorous start to seedlings and the health of the plants.

Sugar-cane.—Small scale work on systems of cultivation, dates of planting, regulation of nutrition and moisture.

Soya beans.—Investigation of merits of soil inoculation with nodule bacteria and of application of superphosphate as a soil corrective.

Lucerne.—Study of possible improvement in system of cultivation, value of soil inoculation with a specific strain of nodule bacteria and determination of optimum stage for cutting, with analyses at different stages of growth, there being no India data.

PLANT BREEDING SECTION.

Selection work will be continued among single-plant cultures of Malvi, Bani, Roseum, Verum, some Cawnpore crosses and Cambodia cottons. The F2 generation of crosses between the following varieties will also be subjected to selection :—

Cawnpore Roseum x Bani ; Malvi x Bani ; Bani x Roseum ; Roseum x Malvi ; Malvi x Cawnpore Roseum.

Crossing.—A desirable early, but delicate Cambodia strain will be crossed with a hardy but late type.

The genetical relation between lint length and ginning percentage.—In this study the F2 generation of a cross between Cawnpore 20 and Bani 13 will be examined statistically.

BOTANICAL SECTION.

Survey of Indian cottons.—Forty-three additional types have been obtained and will be sown, and selfed. As with the types already in hand detailed morphological descriptions and records with drawings will be made, including those of root types. Herbarium specimens will be mounted, also ginned and whole seeds with lint halos, and bolls preserved in formalin.

X-radiation studies.—1. Pure line seed of Malvi, Bani and Roseum cotton will be X-rayed at different dosages and sown alongside controls ; morphological variations from seedling to maturity will be recorded.

2. F1 generation seeds from a cross will be similarly treated.

3. Flower-buds and pollen of Malvi, Bani and Roseum will be X-rayed and the flowers selfed ; also X-rayed pollen applied to an untreated parent. Pollen and ovules will be used in several crosses after exposure.

4. The seeds obtained from X-rayed plants in 1931 will be sown and variations in progeny noted.

5. Wheat seeds from plants X-rayed in 1931 will be sown and variations noted.

Cytological studies.—1. Material from the X-radiation studies will be examined.

2. An investigation of the development of the seed in "No lint" cotton and in Wagale is to be attempted.

FIELD EXPERIMENTS IN STATES.

With the co-operation of the Darbars concerned and in some cases of private cultivators twenty-four replicated field experiments have been arranged as follows :—

Experiment

20a. Yield trial of 5 Malvi strains and local cotton, on the Dhar State Farm.
20b. A duplicate on the Rutlam State Farm.
20c. A duplicate on the Narsingarh State Farm.
21a. Yield trial of 5 types of irrigated cotton (four of Cambodia and Cawnpore 9).
21b. A duplicate on the Rutlam State Farm.
21c. A duplicate on the Narsingarh State Farm.
22a. Yield trial of 4 barani cottons (Verum, Roseum 15, Banilla, Malvi) for the Nimar tract on the estate of Seth Bhanwar Lal Sethi at Sanawad, Holkar State.
22b. A duplicate on the estate of V. S. Khode, Esq., B.A., LL.B., Vakil, at Khargone. Holkar State.
22c. A duplicate on land in Dhar State arranged by the Agricultural Superintendent, Dhar.

Jaipur.

Experiment.

1. Comparative studies on Cambodia, Punjab 289F and Malvi cottons under different systems of cultivation.
2. Yield trial of groundnut varieties.
3. Bajra and Tur spacing test.

The above are to be on the Jaipur State Farm.

Bharatpur.

1. Yield trial of four varieties of barani cottons (Cambodia, Cawnpore 520, Rosea, Bhatla and Mollisoni).
2. Yield trial of four varieties of irrigated cotton (two Cambodia types, Cawnpore 402 and Cawnpore 9).
3. Yield trial of groundnut varieties.

The above are to be on the Bharatpur State Farm.

4. 5. 6. Scheme No. 1 will, it is hoped, also be carried out on three other types of land in the State.

Bikaner.

1. Yield trial of five cotton varieties (Punjab 289F, Cawnpore 402, Cawnpore 520, Sanguineum, N.T. 12 and Mollisoni).
2. Yield trial of three cotton varieties (Acala, Early American, N.T. 39, Roseum, N.T. 10).
3. Single plot trials of twelve cotton varieties.
4. Irrigation test—frequency and quantity—on Mollisoni cotton.
5. Duplicate on Punjab 289F cotton.
6. Date of sowing test on Mollisoni cotton.
7. Manurial test, legume green manure and compost.

The above are on the Ganganagar Farm of Bikaner State, in the Gang Canal Colony, under the special scheme of the Indian Central Cotton Committee.

RABI CROP EXPERIMENTS.

The detailed Field Experiment Schemes for *rabi* crops have not yet been prepared. They will include yield trials of barani and irrigated wheat and probably of gram and linseed.

Those of the Field Experiments begun in the Kharif season which are continuous for several years will of course be in operation.

APPENDIX III.

INSTITUTE OF PLANT INDUSTRY, INDORE.

General Programme of Cotton Research.

(Revised and extended, July 1932.)

Since the initial programme of cotton investigations was drawn up in 1923 the activities of the Institute (which started operations in 1925) have developed and cover a much wider territory.

In addition to Central India this now includes all types of soil and climate in Rajputana, e.g., the arid sandy areas of Bikaner, the somewhat less arid State of Jaipur, the borders of the Jumna valley in Bharatpur and the zone typified by Bundi and Tonk States. The area dealt with in Malwa proper and the low-lying tracts adjoining the Central Provinces and Bombay Presidency has also grown in size by the adherence of new States as well, also, as in Bundelkhand, which again is distinct in agricultural character. Hence a greater variety of problems in cotton cultivation now present themselves and this tendency will continue as more States join the Institute.

The Indian Central Cotton Committee has also recently expressed its desire that the original programme of cotton investigations should be developed and extended.

For these reasons it has become necessary to revise and extend that programme although its main lines are still maintained. The items are not to be regarded as forming a rigid and limiting basis of work; in all scientific research glimpses into unknown and attractive country are afforded from time to time and exploration must be permitted.

(*a*) Botanical Survey.

Up to the present, little or no attempt has been made in India to isolate, classify and study the unit species which form the framework of the various species and varieties of cotton. It is true that the Indian cottons have been classified and surveyed from the point of view of systematic botany, but this is entirely inadequate for modern work as by this method cottons of very different agricultural value are not distinguished. This work has a direct practical bearing. It will, in all probability, lead to the isolation of useful types for distribution. It will also provide material for the plant-breeder and for critical work on the physiology and agronomy of cotton. In addition a revision of the present systematic classification of cottons will be considered, the collection of types already amassed providing good material for comparative studies.

(*b*) Cotton Breeding and Selection—Economic.

(*i*) The creation, establishment and maintenance of an island of improved cotton on the Malwa plateau. The types isolated will be available for other areas in India and the crop will enable a grade of improved cotton to be established for the mills and for the shippers.

(*ii*) The introduction of a pure and improved early-ripening, hardy cotton for the low-lying tracts of Central India.

(*iii*) The discovery of the most profitable cotton to be grown in the new Gang Canal Colony, Bikaner.

(*iv*) The selection of a pure improved cotton or cottons to replace the mixtures grown in other parts of Rajputana and in Bundelkhand.

(c) Cotton Genetics.

The mode of inheritance of characters in cottons will be studied. Many problems await investigation; among them one of the most important is the genetical relationship between the factors determining lint length and ginning percentage with the associated variations in yield.

The effects of exposing cotton seeds, buds and pollen to X-Rays and radium emanations will be investigated with a view to producing mutants of economic value. It has been found by several workers in recent years that such treatments have the effect of violently disturbing the arrangement of chromosomes and even of genus in the germ cells and consequently producing types differing widely from the parent. The possibility of thus producing new types of economic value has hardly been touched as the whole subject is in its infancy and an entirely new field of unknown possibilities is awaiting exploration. Both these studies will also involve cytological work.

(d) The Physiology of the Cotton Plant.

In order to increase production something more than improved varieties is needed. The new varieties must be provided with suitable conditions for growth. To discover these, the physiology of the cotton plant must be studied and the factors which now limit production must be determined. This involves the study of root-development, the relations of the root-system to the soil type and the influence of factors, such as soil moisture, soil-aeration and drainage, soil texture and soil temperature, on growth. Included in these studies is the discovery of the factors which produce the shedding of buds, flowers and bolls. The general nutrition of the cotton plant will also be considered and how far the yield can be improved by manuring and other methods of soil treatment.

In the course of these studies many more types of soil are now involved than those of the Malwa plateau and accordingly a collection of soil profile samples will be made from different parts of the area covered. Mechanical analysis and other examinations will be made so that the behaviour of cotton may be correlated with their characteristics.

(e) The Influence of Environmental Factors in the Lint Characters.

Modern industries demand a uniform product. Once this is obtained, the purchase of raw material as well as the details of manufacture are simplified. In the case of cotton, any tract which can produce uniform lint will rapidly establish its reputation in the trade. It is well known, however, that the cotton fibre alters in character according to the soil on which it grows and to some extent according to the season. Further work is desirable on this matter with the object of discovering what factors bring about these changes, which varieties are most easily affected and whether any practical remedies exist for improving the uniformity of the fibre of the same cotton. This portion of the work is of direct bearing on the question of the maintenance of grades of cotton for the highest class of spinning in this country. It is hoped to resume this piece of work on somewhat more intensive lines than those previously adopted.

(f) Field Experiment Technique.

With the exception of preliminary trials all field experiments involved by the programme will be laid out either on the replicated Randomized Block or the Latin Square system as elaborated at the Rothamsted Experimental Station or with such later developments as seem desirable to adopt. Modern developments in statistical mathematics will be used in interpreting results.

APPENDIX IV.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

——	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546	610,288
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257
Bombay Presidency ..	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,131,327
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820
Central Provinces and Berar	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681
Rest of British India ..	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342
Total—British India..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,986,285
Total—Indian States..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793
Total—India ..	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,345,078

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Hyderabad ..	15,210	16,697	19,067	20,823	23,074	31,290
Mysore	43,571	44,320	39,619	46,590	43,326	49,293
Baroda	46,070	46,884	48,852	59,043	62,578	58,534
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892
Indore	53,526	65,391	76,070	83,026	88,620	95,296
Other Indian States	46,809	52,581	57,224	64,454	71,191	78,488
Total ..	229,443	251,589	277,540	315,399	333,996	358,793

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Bombay	28,328	24,970	27,324	24,361	54,409	74,979
Madras	35,198	39,560	52,188	46,582	55,717	99,389
United Provinces .	16,991	10,308	13,878	20,441	18,496	12,572
Central Provinces and Berar ..	40,762	20,861	6,924	16,243	15,771	20,743
Punjab	3,910	4,739	3,760	4,361	4,307	2,317
Total ..	125,189	100,438	104,074	111,988	148,700	210,000

APPENDIX V.

Subject.—ENQUIRY INTO THE COTTON TEXTILE INDUSTRY.

Copy of letter No. 168, *dated the* 22*nd April* 1932, *from the Secretary, Tariff Board, Bombay, to the Secretary, Indian Central Cotton Committee, Bombay.*

In connection with the Tariff Board enquiry into the Cotton Textile Industry, I am directed to ask that you will be good enough to supply the Board with information on the points noted below :—

(*i*) Please refer to paragraph 81 and Appendix XIII of the Report of the Indian Tariff Board, 1927, and your Committee's pamphlet on Cotton Improvement in India, 1931, Chapter V. What is the present available supply of long-staple cotton in India ? What is the net supply available for use in Indian mills ? What are the counts of yarn in the manufacture of which Indian long-staple cotton may be used ?

(*ii*) To what extent is the raw cotton now imported into India of the same quality as Indian long-staple cotton ? Does the present import duty on raw cotton materially help the Indian cultivator ?

(*iii*) Does the present position of the world's cotton crops justify the assumption that there is overproduction ? If so, can it be argued that a decline in the output of the Indian mills will adversely affect the Indian cultivator of cotton ? This of course assumes that the countries to which Indian cotton is now exported may obtain increasing supplies of short-staple cotton from other countries. It is in fact suggested that such a tendency is already noticeable, especially in the case of Japan.

2. I am to request that the reply to this letter (with six spare copies) may be sent as early as convenient, if possible not later than the 15th of June.

REPLY.

Subject.—ENQUIRY INTO THE COTTON TEXTILE INDUSTRY.

Before answering the specific questions asked in the letter of the Textile Tariff Board it would be as well to give a short history of the Indian cotton crop since the 1925-26 season when the Committee supplied a note to the previous Board.

It has to be realised at the outset that the year 1925-26 was a record one in the history of Indian cotton, the estimated production (final figures) being 6,215,000 bales, which is 127,000 bales more than the previous recorded figure of 6,088,000 bales in 1924-25, and 2,151,000 bales more than the estimated production of the current season. During the season 1925-26, the short-staple and all varieties of long-staple crops fared very well, but since then there has been no year in which one or other of the long-staple varieties has not been affected by the vagaries of the season. Further, the low prices of 1925-26 were largely responsible for the sharp decline in the total area sown from 28.4 million acres in 1925-26, to 24.8 million in 1926-27. This level was maintained in 1927-28, and the area then rose to 27.1 million in 1928-29, fell to 25.9 million in 1929-30, and as a result of low prices in that season again fell to 23.8 million in 1930-31, and 23.5 million in 1931-32. It will thus be seen that both unseasonable weather conditions and reduced area are responsible for the small crops since 1925-26.

The form of the statement defining long and short staple cotton sent in 1926 by the Committee to the Tariff Board was taken from the classification adopted in Annexure II of the Report of the Indian Cotton Committee of 1919 and in order to make the present-day figures comparable with those submitted to the previous Board, the same classification has again been adopted. Cotton $\frac{7}{8}$" and over has been classified as long staple while

cotton up to 13/16″ has been taken as short staple. For mill purposes, however, many of the types included in the long-staple class, due to unevenness in staple or lack of strength, fall short of the definition of long-staple cotton given below, viz., that capable of spinning 24s warp counts and above. We therefore attach a second statement showing the quantity of commercial long-staple cotton grown in India, i.e., those qualities capable of spinning 24s warp counts and above.

Questions.—1 (*a*).—What is the present available supply of long-staple cotton in India?

1 (*b*).—What is the net supply available for use in Indian mills?

Answers.—My Committee is not quite sure what is meant by the word 'available' in the first question. A particular cotton may be available in so far as it may be grown, but it may be unobtainable by the mills because, for one reason, of the malpractice of mixing in the intermediate stage of marketing. Nearly 85 per cent. of the Punjab-American crop in the Punjab is sold by the grower with a maximum amount of approximately 10 per cent. mixture of *desi* cotton, but owing to mixing during the process of marketing the same amount of staple cotton is not available to the trade. My Committee therefore prefers to answer the first two questions 1 (*a*) and 1 (*b*) by giving in two tables firstly, the total amount of long-staple cotton *produced* in the country and secondly, by furnishing an estimate of the amount of commercial long-staple cotton available for consumption. In the latter case only those types capable of spinning 24's warp counts and above are included. A cotton may be $\frac{7}{8}$″ in length but may still be incapable of spinning 24's and is thus excluded from the second table, though it may be found under the long-staple classification in the first table.

TABLE I.

Indian Cotton Crops classified by staple lengths.

(In thousands of bales of 400 lbs. each.)

	1931-32 (as estimated in the forecasts).
LONG STAPLE—$\frac{7}{8}$ inch and above.	
Oomras—	
Hyderabad Gaorani	115
Verum 262	20
Broach—	
Surat-Navsari, mostly 1027 A. L. F. (Staple 1″)	103
Others	120
Kumpta-Dharwar—	
Gadag 1 (Staple 1″)	13
Jayawant (Staple 1″)	12
Others	224
Westerns and Northerns—	
Hagari 1 (Staple $\frac{7}{8}$″)	28
Nandyal 14 (Staple 15/16″ to 1″)	2
Others	191
Tinnevellys—	
Karunganni C.7 (Staple 1″) Karunganni, others (Staple $\frac{7}{8}$″) Others	140*
Cambodia—	
Coimbatore-2 (Staple 1″)	32
Irrigated Cambodia (Staple 1″)	59
Others	30
Punjab and Sind-Americans—	
289-F (Staple 1″ to 1-1/16″) 4-F (Staple $\frac{7}{8}$″)	231*
Total—Long Staple	1,320
SHORT STAPLE—Below $\frac{7}{8}$ inch.	
Oomras (part)	1,188
Broach (part)	57
Dholleras	577
Bengals	785
Salems	36
Cocanadas	34
Comillas, Burmahs, etc.	67
Total—Short Staple	2,744
Grand Total	4,064

* Separate figures not yet available.

Over a period of ten years previous to the present season, the average of long-staple cotton to the total crop has amounted to 26.7 per cent. so that it can be taken that roughly one-fourth of the Indian crop is long staple.

TABLE II.

Classification of long-staple Indian cottons capable of spinning 24's standard warp counts and above.

(In thousands of bales of 400 lbs. each.)

LONG STAPLE—$\frac{7}{8}$ inch and above.	(As estimated in the forecasts.)
Oomras—	
Hyderabad Gaorani	115
Verum 262	20
Broach—	
Surat-Navsari, mostly 1027 A. L. F. (Staple 1″)	70
Kumpta-Dharwar—	
Gadag 1 (Staple 1″)	13
Jayawant (Staple 1″)	12
Kumpta and Dharwar-Americans	75
Westerns and Northerns—	
Hagari 1 (Staple $\frac{7}{8}$″)	28
Nandyal 14 (Staple 15/16″ to 1″)	2
Others	81
Tinnevellys—	
Karunganni C-7 (Staple 1″) Karunganni, others (Staple $\frac{7}{8}$″) Others	140*
Cambodia—	
Coimbatore-2 (Staple 1″)	32
Irrigated Cambodia (Staple 1″)	59
Others	30
Punjab and Sind-Americans—	
289-F (Staple 1″ to 1-1/16″)	8
4-F (Staple $\frac{7}{8}$″)	50†
Total long staple ..	735

* Separate figures not yet available.

† Contains up to 10 per cent. mixture.

The quantity of Indian long-staple cotton available to Indian mills for spinning the higher counts is not necessarily that given in the above table for the following reasons :—

(1) It may not be economic for every mill in India to use only Indian cotton for spinning counts above 24's.

(2) The mills spinning higher counts are not all concentrated in areas growing superior types of cottons.

(3) The mills in such areas and inefficient mills may waste superior types in spinning lower counts.

(4) Some quantity of long-staple cotton is used in hand spinning and for domestic purposes.

(5) A portion of the long-staple crop is exported.

No estimate of the first four factors is possible but the amount of long-staple cottons exported from India is ascertainable. The bulk of the long-staple cotton exported from India may be taken to be that grown in Madras Presidency. Last year this amounted to 70,000 bales which may be taken as a fair average. If, therefore, the first four factors are ignored, the quantity of long-staple cottons produced in India and available for use in Indian mills amounts this year to 6.65 lakh bales.

Question 1 (*c*).—What are the counts of yarn in the manufacture of which Indian long-staple cotton may be used ?

Answer.—24's to 32's warp and 26's to 40's weft counts.

Question (*ii*) (*a*).—To what extent is the raw cotton now imported into India of the same quality as Indian long-staple cotton ?

Answer.—Below will be found a statement showing the quantities and staple lengths of American, Egyptian and East African cottons imported into India during the last 2½ years. The only cottons which can be said to compete effectively with Indians are those between ⅞″ and 1″ in length. Except for a crop of 8,000 bales of 1-1/16″ staple grown in the Punjab, India does not so far produce any cotton of greater staple than 1″. It will be seen from the table that the bulk (70 per cent.) of the American cotton imported competes with Indian styles while from Egypt and Africa is imported cotton not grown in India and therefore not competitive.

STAPLE LENGTHS OF IMPORTED COTTONS.

(*From 1st September* 1929 *to 1st May* 1932.)

TABLE III.

Americans.

Staple length.	Total No. of Bales.		
Below ⅞″	1,000		
⅞″	33,810		
29/32″	53,705		
15/16″	91,190		
31/32″	28,038		
1″	8,785	*Actual Imports.*	
1-1/32″	11,150		Bales.
1-1/16″	28,800		
1-3/32″	13,085	1929-30	12,759
1-1/8″	14,900	1930-31	128,845
1-5/32″	200	Up to 1st May 1932	168,475
Total ..	284,663	Total ..	310,079

TABLE IV.

Egyptians and East Africans.

	Total No. of Bales.				Remarks.
	Egyptians.		East Africans.		
1″	....		2,200		
1-1/32″	....		..		*Staple 1-1/16″ to 1-3/16″
1-1/16″	3,875		700	‖24,000 ..	† Staple 1⅛″ to 1¼″
1-3/32″	100		..		
1⅛″	2,981		..		‡ Staple 1-9/32″ to 1½″
1-5/32″	..	*5,475		*52,167 ..	
1-3/16″	3,740	†8,100			§ Staple over 1½″
1-7/32″	..	‡2,300			
1¼″	6,968				‖ Staple 1″ to 1⅛″
1-9/32″ to 1-15/32″	..	§1,195			
	955				
1½″	4,997				
Total ..	40,686		79,067		

Actual imports (in 3½-cwt. bales).

1929–30	12,387	134,533
1930–31	148,947	179,473
Up to 1st May 1932	94,226	73,580
Total ..	255,560	387,586

N.B.—The figures of imports of foreign cotton given above have been supplied through the courtesy of importers. From 1st September 1929 to 30th April 1932, 310,079 bales of American cotton were imported, and information regarding their staple lengths has been furnished voluntarily for 92 % of that quantity.

The reason for the meagre information supplied concerning Egyptian and East African cottons is that some importers have not replied to our request for information and some have not kept a record of the staple lengths of the bales imported by them.

Question (ii) (b).—Does the present import duty on raw cotton materially help the Indian cultivator ?

Answer.—The bulk of the Indian crop being short staple, there is no competition from outside sources with cotton less than ⅞″, so that the imposition of an import duty on this type of cotton can have had no effect on the majority of the Indian growers of cotton. There is also no competition in India with cottons over 1″ in staple except for the 8,000 bales of 289F of 1-1/16″ staple grown in the Punjab. We understand, however, that there may be a great future for cottons of this staple in Sind and the Punjab. For the effect of the duty on the intermediate staples between ⅞″ and 1″, there is only the experience of the past eight months to fall back on and this has been a period in which abnormal factors have predominated in the world's markets, e.g., a big and high-class American cotton crop being dumped on the world's markets, and the general trade depression. It is therefore difficult to say to what extent the grower of staple cotton in India has benefited by the duty during this period but under normal conditions and circumstances an import duty on cotton should afford protection to the grower of these staples.

Question (*iii*) (*a*).—Does the present position of the world's cotton crops justify the assumption that there is overproduction ?

Answer.—Yes, in the respect that for the present the supply is greater than the demand.

Question (*iii*) (*b*).—If so, can it be argued that a decline in the output of the Indian mills will adversely affect the Indian cultivator of cotton ?

Answer.—Yes, it is certainly so in regard to cotton from $\frac{7}{8}$″ to 1″ because the export demand in regard to such cotton is entirely dependent on its cheapness in comparison with American. What ensures a reasonable price to the grower of such cottons is the Indian mill demand. This was clearly brought out during the seasons 1926-28, when large quantities of cheap low grade American cotton were imported to replace Indian cotton. The position therefore is that a part of the Indian cotton crop, varying from 1 to 2 million bales, will, if not taken up by Indian mills, be dumped on the export market and thus depress it. It can therefore be presumed that a decline in the output of Indian mills will adversely affect the price of Indian cottons of $\frac{7}{8}$″ to 1″ staple. Past experience also shows that in time of strike in the mills in Bombay and Ahmedabad the general tone of the home markets has not been altogether wholesome. In regard to cottons below $\frac{7}{8}$″ there is also a danger of such an adverse effect taking place when a short output of Indian mills coincides with an increase of short-staple American cotton due to deterioration.

Question (*iii*) (*b*) 2.—Does the Indian cultivator normally get a lower nett price for cotton exported than for cotton sold to mills ?

Answer.—No. The conditions in the markets are such that the grower gets the best price for his produce owing to competition between buyers whether for export or home consumption. The highest bidder obtains the cotton, and as roughly half the crop is exported and half used in the country, it is safe to assume that there is no differentiation in rates.

APPENDIX VI.

Subject.—USE OF LONG-STAPLE COTTON BY INDAIN MILLS.

Copy of letter No. 363, dated the 21st September 1932, from the Secretary, Indian Central Cotton Committee, Bombay, to the Secretary, Indian Tariff Board.

During the course of the oral evidence tendered by the representatives of the Indian Central Cotton Committee, it was suggested by the President of the Board that there was a wastage of wealth owing to the practice of using long-stapled Indian cotton for the production of yarns of lower denominations than the cotton was actually suited to spin, and that on this account either the mills or the cultivators of cotton suffered. The proposition enunciated by the President of the Board required detailed examination and the representatives of the Indian Central Cotton Committee therefore asked to be given an opportunity of examining it more closely. This further examination has now been completed, and I have the honour to submit the considered views of my Committee on this matter. In studying the situation, the representatives of my Committee had the benefit of the consultation with the representatives of the East India Cotton Association, the Millowners' Association, Bombay, and the Millowners' Association, Ahmedabad, and the opinions hereafter expressed on the remark of the President, Tariff Board, represent the agreed views of all these interests.

2. On the general proposition as to whether cotton growers suffer any financial loss on account of mills in India using Indian staple cottons at times for production of counts lower than the maximum counts which such cottons are capable of spinning, there is complete agreement that full market rates are invariably paid for all cotton purchased from the grower, including staple cottons, irrespective of the uses to which such cottons may be put. Therefore, whether cotton bought by mills is used for the purpose of spinning higher or lower counts, the agriculturist does not suffer by mills in India spinning lower counts than the maximum counts that can be spun out of such cotton. The conclusion of the Associations on whose behalf this reply is being sent unequivocally is that no financial sacrifice or waste is made at the expense of the agriculturist in this connection. Whether mills in India in every instance make the fullest economic use of the staple cottons which they purchase, is, therefore, the only question which remains to be examined and I have the honour to submit that this question can be more properly dealt with by the representatives of the millowners in India, should the Tariff Board refer it to them. As far as the Indian Central Cotton Committee is concerned, their direct and main interest is the interest of the cotton grower and if the first proposition named in this paragraph is not challenged by the Tariff Board, I feel that I may leave this question at this point whilst dealing with the question raised by the President.

3. As regards the manner in which the long-staple cotton crop is utilized, the results of my Committee's further investigations are stated below. In Appendix (A) will be found a statement showing the production of Indian cotton suitable for spinning 24's counts and above. This table has been drawn up on the same basis as Table II of my Committee's written evidence to the Board, and shows that the average production for the three cotton seasons 1929-32, was 714,000 bales of 400 lbs. weight. The whole of this cotton, however, was not available for commercial purposes. A portion was utilized for hand-spinning and other domestic purposes. When considering the whole of the Indian cotton crop of five to six million bales, it is generally accepted that 750,000 bales—about 15 per cent. of the crop—are used for domestic purposes. Assuming that the proportion of staple cotton used for domestic purposes is the same as for other types, then 15 per cent. of 714,000 bales, i.e., 107,000 bales, would be consumed locally leaving 607,000 bales for export and mill consumption.

4. With regard to the exports of the particular class of cotton under consideration it has to be pointed out that the seaborne trade statistics compiled and published by the Director-General of Commercial Intelligence and Statistics, which is the only *complete statistics for exports of cotton from India*, does not distinguish between the different varieties of cotton. There is, however, another set of statistics which is helpful. Through the

courtesy of a number of exporting houses the Indian Central Cotton Committee have been able to collect details of exports to different countries classified according to the usual trade descriptions on the definite understanding that figures relating to individual firms would not be divulged to the public. These figures are given in Appendix (B), and they show that the total average exports from India during the seasons 1929-31 were as follows :—

	Bales.
Hyderabad Gaorani (whole)	39,000
Tinnevellies (whole)	56,000
Cambodias (whole)	55,000
Westerns and Northerns *(half)	30,000
Kumpta-Dharwar *(one-third)	2,000
Broach *(less than a third estimate)	25,000
Punjab-American †(one-tenth estimate)	42,000
Total ..	249,000

N.B.—Figures for 1931-32 are not yet available.

From these figures it may be inferred that *not less than* 2.49 lakhs bales of long-staple cotton were exported, leaving only 3.58 lakhs for consumption in Indian mills.

5. The words "*not less than*" are used here advisedly, because the returns received by the Indian Central Cotton Committee from exporters in this connection did not account for the entire exports from India of Indian cotton as published by the Director-General of Commercial Intelligence and Statistics. There is, therefore, every reason to believe that the above figures are, if anything, on the low side.

6. The next point for consideration is whether the whole of this long-staple cotton was absorbed by Indian mills. As there was general agreement amongst the representatives of the various bodies referred to by me, that there were no reports of unsaleable quantities of staple cottons during the seasons referred to, they believe that it is justifiable to infer that the long-staple cottons available in India were absorbed by mills in India. On the other hand, it is the general experience of mills that owing to scarcity the premiums which have to be paid for staple cottons increase in July, August and September.

7. The last point to be examined is whether the staple cotton which was absorbed by the mills was properly utilized, in other words, whether it was utilized in the production of finer count yarns. In the written evidence submitted to the Board by the Indian Central Cotton Committee, it was indicated that mills situated in areas in which long-staple cotton is grown sometimes find it convenient to spin from staple cotton yarns of counts lower than those for which the cotton grown in the vicinity is suited. In this connection, it is necessary to bear in mind that cotton suitable for lower counts from other areas is comparatively more costly to such mills owing to the heavy cost of railway freight which such short-staple cotton has to bear for import into these areas. To what extent staple cotton was spun into counts lower than it was capable of spinning may now be examined. In Appendix (C) will be found a table shewing India's yarn production during the last ten years classified according to counts. In Appendix (D) the calculated quantities of raw cotton, Indian and foreign (at 1 lb. of yarn = 1.18 lbs. raw cotton) as worked out in Appendix (E) necessary for the production of counts 24's and above are given separately. Consideration of these two tables shows that on the average of the last three years 398,000 bales of staple cotton must have been used in the production of 24's and above. This figure is reasonably close to the estimated figure of 358,000 bales of suitable staple cotton available to the mills taking into consideration the obvious shortcomings of our statistical data and other evidence available. It would not therefore be incorrect to infer that staple cottons are on the whole put to proper use by Indian mills bearing in mind the location of Indian mills as referred to above.

* On the same basis as Appendix (A). † Only a rough estimate.

APPENDIX (A).

Classification of long-staple Indian cottons capable of spinning 24's standard warp counts and above.

(In thousands of bales of 400 lbs. each.)

LONG STAPLE—$\frac{7}{8}$ inch and above.		(*As estimated in the forecasts.*)		
		1931-32.	1930-31.	1929-30.
Oomras—				
Hyderabad Gaorani	(Entire crops.)	115	126	125
Verum 262		20	11	7
Broach—				
Surat-Navsari, mostly 1027 A.L.F. (Staple 1″)	(Estimated round figure.)	70	70	70
Kumpta-Dharwar—				
Gadag 1 (Staple 1″)		13	11	16
Jayawant (Staple 1″)		12	7	10
Kumpta and Dharwar-Americans ..	($\frac{1}{3}$ of the remaining crop.)	75	53	86
Westerns and Northerns—				
Hagari 1 (Staple $\frac{7}{8}$″)	(Half of the total crop.)	28		
Nandyal 14 (Staple 15/16″ to 1″) ..		2	91	86
Others		81		
Tinnevellys—				
Karunganni C-7 (Staple 1″)	(Entire crop.)			
Karunganni others (Staple $\frac{7}{8}$″.) ..		140	129	162
Others				
Cambodia—				
Coimbatore-2 (Staple 1″)	(Entire crop.)	32		
Irrigated Cambodia (Staple 1″) ..		59	90	144
Others		30		
Punjab and Sind-Americans—				
289-F (Staple 1″ to 1-1/16″)	(Entire crop. Estimated round figure.)	8	12	2
4-F (Staple $\frac{7}{8}$″)		50*	50*	50*
Total long staple		735	650	758
Total for 3 years		2,143		
Average		714		

* Contains up to 10% mixture.

APPENDIX (B).

Exports of Long-Staple Cotton from India.

(In thousands of bales.)

Year ending 31st August	Hyderabad Gaorani	Punjab-American.	Sind-American.	Broach.	Kumpta-Dharwar.	Westerns & Northerns.	Tinnevellies.	Cambodias.	Total.
1931-32 ..									
1930-31 ..	24	418	34	81	2	44	42	45	690
1929-30 ..	54	419	17	88	9	75	70	65	797
1928-29 ..	44	328	10	59	23	70	76	17	627
1927-28 ..	18	314	..	166	17	28	54	..	597
1926-27 ..	11	252	..	112	1	10	46	2	434
1925-26 ..	20	496	..	210	20	87	92	17	942
1924-25 ..	5	365	..	285	35	83	117	67	957
1923-24 ..	53	253	..	241	38	49	130	60	824
1922-23 ..	5	91	..	262	23	42	26	36	485

APPENDIX (C).

Yarn Production in India.

For years ending 31st March.

(In millions of pounds.)

Year ending 31st March	Counts.						Waste.	Total.
	1-10.	11-20.	21-23.	24-30.	31-40.	Above 40.		
1931-32 ..	117	445	129	165	71	34	5	966
1930-31 ..	114	400	115	144	61	27	6	867
1929-30 ..	106	388	127	145	46	15	7	834
1928-29 ..	79	303	97	116	37	10	6	648
1927-28 ..	106	389	122	141	34	11	6	809
1926-27 ..	115	401	113	135	28	11	4	807
1925-26 ..	96	349	98	116	20	6	1	686
1924-25 ..	93	377	102	122	19	6	*	719
1923-24 ..	85	327	82	100	20	3	*	617
1922-23 ..	103	376	98	111	16	2	*	706

* Less than a million pounds.

APPENDIX (D).

RAW COTTON CONSUMED IN INDIAN MILLS.

(In thousands of bales of 400 lbs. nett.)

Year ending 31st March	Calculated (1 lb. yarn=1.18 lbs. raw cotton) quantity of raw cotton required to spin the yarn produced in India.				Net imports of foreign cotton.*	Indian cotton used for producing yarn 24's and above.
	24-30	31-40	Above 40	Total.		
1931-32 ..	487	209	100	796	443	353
1930-31 ..	425	180	80	685	327	358
1929-30 ..	428	136	44	608	126	482
Total ..	..	..	..	..	..	1,193
Average ..	..	..	..	..	..	398

* Imports of foreign cotton less re-exports.

APPENDIX (E).

Calculation of waste percentage ratio from known cotton consumption and yarn production.

(In thousands of bales of 400 lbs.)

Year ending 31st March	Indian cotton consumed in Indian mills. (*a*)	Foreign cotton imported into India. (*b*)	Total cotton taken by Indian mills.	Yarn Production (in millions of pounds) excluding waste.	REMARKS.
1931-32	2,342	443	2,785	961	(*a*) Figures compiled by the Indian Central Cotton Committee from cotton cess returns from British Indian mills and voluntary returns from Indian State mills.
1930-31	2,266	327	2,593	861	
1929-30	2,248	126	2,374	827	
1928-29	1,764	159	1,923	642	
1927-28	1,984	354	2,338	803	(*b*) It cannot be assumed that cotton imported during any year is consumed in the same year, but over a number of years the difference caused by this factor will not be appreciable.
1926-27	2,159	244	2,403	803	
1925-26	2,007	53	2,060	685	
1924-25	2,051	47	2,098	719	
1923-24	1,798	33	1,831	617	
Total ..	18,619	1,786	20,405	6,918	

For all nine years, total cotton taken by mills .. .. = 20,405,000 bales.
= 8,162,000,000 lbs.
Do. total yarn production .. .. .. = 6,918,000,000 lbs.
∴ 1 lb. yarn .. .. .. = 1.1798 lbs. cotton.
For last two years, total cotton taken by mills .. .. = 5,378,000 bales.
= 2,151,200,000 lbs.
Do. total yarn production .. .. .. = 1,822,000,000 lbs.
∴ 1 lb. yarn. .. .. .. = 1.1806 lbs. cotton.

Hence the general average may be taken as 1 lb. yarn=1.18 lbs. cotton.

APPENDIX VII.

THE CENTRAL PROVINCES COTTON MARKET ACT, 1932.
(No. IX of 1932).

An Act to provide for the establishment and better regulation of cotton markets in the Central Provinces.

Preamble.

WHEREAS it is expedient to provide for the establishment and better regulation of the recognized open markets for the purchase and sale of cotton in the Central Provinces;

And whereas the previous sanction of the Governor-General required by sub-section (3) of section 80-A of the Government of India Act and the previous sanction of the Governor required by section 80-C of the said Act have been obtained for the passing of this Act;

It is hereby enacted as follows :—

Short title.

1. This Act may be called the Central Provinces Cotton Market Act, 1932.

Extent.

2. This Act shall apply to the whole of the Central Provinces.

Definitions.

3 In this Act, unless there is anything repugnant in the subject or context,—

"Cotton."

(*i*) "cotton" includes ginned as well as unginned cotton;

"Cotton market."

(*ii*) "cotton market" means a market established under section 4 of this Act;

"Grower of cotton."

(*iii*) "grower of cotton" shall not include a dealer or broker in cotton, although such a person may grow cotton. If a question arises whether any person is a grower of cotton or not for the purpose of this Act, the decision of the Deputy Commissioner of the district in which the person permanently resides shall be final;

"Prescribed."

(*iv*) "prescribed" means prescribed by rules or bye-laws made under this Act.

Establishment of cotton market.

4. (1) The Local Government may, after consulting the district councils, local boards, municipalities, sanitation panchayats, notified area committees and village panchayats in the areas affected or, upon a representation made by them (or by growers of cotton within such areas), by notification, declare that any place is a cotton market established under this Act.

(2) Every such notification shall define the limits of the cotton market so established and may for the purposes of this Act include within such limits such local area as the Local Government may prescribe.

Market Committee.

5. For every market there shall be a market committee. The market committee shall be constituted as prescribed and shall consist of not less than ten and not more than sixteen members. Of these, not less than half shall be persons elected by cotton growers of such area as the Local Government may prescribe. One shall be elected by the district council or the local board of the district in which the market is situated in the manner prescribed, one by the municipality, notified area committee, village sanitation panchayat or village panchayat, whichever may be the local body within whose area of authority the market is situated, and the remainder shall be elected by the traders in the cotton market in such manner as may be prescribed.

Power to make rules.

6. (1) The Local Government may, either generally or specifically for any cotton market or group of cotton markets, make rules consistent with this Act for the purpose of the management and regulation of such cotton markets under this Act.

(2) In particular and without prejudice to the generality of the foregoing power such rules may provide for or regulate :—

(*i*) the election of members of the market committee, the number of members to be elected by each of the bodies or groups of individuals referred to in section 5, and the manner of election, the preparation and revision of lists of voters from time to time, and the term of office of such members ;

(*ii*) the qualifications and disqualifications of voters and the candidates for election ;

(*iii*) the powers to be exercised and the duties to be performed by the market committee ;

(*iv*) the election of the chairman and vice-chairman of such committee, their powers and term of office ;

(*v*) the filling of casual vacancies in the office of members or in the office of chairman or vice-chairman of the market committee ;

(*vi*) the management of the cotton market and the prescribing of fees by the market committee, and, subject to the provisions of this Act, the collection and disposal of such fees ;

(*vii*) the issue by the market committee of licences to brokers, weighmen, measurers, surveyors and warehousemen and other persons using the cotton market and fixing the fees leviable by them, the form in which and the conditions under which such licences shall be issued, and the fees to be charged for such licences ;

(*viii*) the place or places at which cotton shall be weighed or measured, and the kind and the description of the scales, weights and measures to be used at such place or places ;

(*ix*) the periodical inspection, verification, correction, regulation and confiscation of scales, weights and measures in use in the cotton market ;

(*x*) the trade allowances which may be made or received by any person in any transaction in a cotton market ;

(*xi*) the preparation of plans and estimates for works proposed to be constructed partly or wholly at the expense of the market committee, and the grant of sanction to such plans and estimates ;

(*xii*) the form in which the accounts of the market committee shall be kept, the manner in which they shall be audited and the time or times at which they shall be published;

(*xiii*) the preparation of an annual budget and its submission for sanction, and the reports and returns which shall be furnished, by the market committee ;

(*xiv*) the disposal of any surplus or part of surplus funds of the market committee ;

(*xv*) the time, place and manner in which a contract between buyer and seller is to be entered into and the money is to be paid to the seller ; and

(*xvi*) generally, for the guidance of the market committee and for carrying out the purposes of the Act.

(3) Any such rule may, when necessary, provide that any contravention thereof or of any of the conditions of any licence issued thereunder shall be punishable, on conviction by a competent magistrate, with a fine which may extend to five hundred rupees.

(4) All rules made under this section shall be subject to the condition of previous publication. A copy of the draft of the proposed rules shall be laid on the table of the Central Provinces Legislative Council. The Local Government shall give the Council an opportunity of discussing them, and shall take into consideration any resolution concerning the same which may be passed by the Legislative Council before finally publishing them in the *Central Provinces Gazette*.

Bye-laws.

7. (1) Subject to the rules made by the Local Government under the last preceding section, the market committee may, in respect of the cotton market under its management, make bye-laws for :—

(*i*) the regulation of the business,

(*ii*) the conditions of trading,

(*iii*) appointment and punishment of its officers and servants,

(*iv*) payment of salaries, pensions, gratuities, and leave allowances to such officers and servants, and contributions by them to any provident fund which may be established for the benefit of such officers and servants, and

(*v*) the delegation of powers, duties and functions of the sub-committee, if any, appointed under section 8 ;

and may provide that contravention thereof shall be punishable by a competent magistrate with a fine which may extend to fifty rupees.

(2) All bye-laws made under sub-section (1) shall be subject to the condition of previous publication and no bye-law shall take effect until it has been confirmed by the Local Government.

Sub-committee.

8. The market committee may appoint from amongst its members a sub-committee for the performance of any of its duties or functions.

Contract how executed.

9. (1) Every contract entered into by the market committee shall be in writing and shall be signed on behalf of the market committee by the chairman and two other members of the market committee.

(2) No contract other than a contract executed as provided in sub-section (1) shall be binding on a market committee.

Cotton market fund.

10. All moneys received by a market committee shall be paid into a fund to be called "The Cotton Market Fund," and all expenditure incurred by the market committee under or for the purposes of this Act shall be defrayed out of the said fund ; any surplus remaining after such expenditure has been met shall be expended as may be prescribed in the rules made in this behalf.

Purposes for which fees collected by market committee may be expended.

11. Subject to the provision of section 10, all fees collected by the market committee under this Act or the rules made thereunder shall be expended only on :—

(1) the maintenance and improvement of the cotton market ;

(2) the construction and repair of buildings which are necessary for the purposes of such market or for the health, convenience and safety of the persons using it ;

(3) the planting of trees, rearing them, making arrangements for providing water to the persons and cattle coming to the market, and like purposes ;

(4) the meeting of establishment charges, including payments and contributions towards provident fund, pension and gratuities of the officers and servants employed by the market committee;

(5) the preparation and revision of voters' lists, and the elections and by-elections of the cotton market committee;

(6) with the previous sanction of the Local Government, any other purpose whereon the expenditure of the cotton market fund is in the public interest; and

(7) the expenses incurred in auditing the accounts of the committee.

No trade allowance permissible unless recognized by rules or bye-laws.

12. (1) No trade allowance, other than an allowance prescribed by rules or bye-laws made under this Act, shall be made or received by any person in any transaction in a cotton market established under this Act, and no civil court shall, in any suit or proceeding arising out of any transaction in any such cotton market, have regard to any trade allowance not so prescribed.

(2) Any purchaser who makes deductions on account of *dharmadaya*, *gorakshana*, or similar other objects shall be liable on conviction to a fine which may extend to fifty rupees for each offence.

Market committee to be a body corporate.

13. Every market committee shall be a body corporate and shall have perpetual succession and a common seal and may sue and be sued in its corporate name, and shall be competent to acquire and hold property, both moveable and immoveable, to lease, sell or otherwise transfer any such property which may have become vested in or been acquired by it, and to contract and to do all other things necessary for the purposes of this Act:

Provided that no committee shall permanently transfer any immoveable property except in pursuance of a resolution passed at a meeting by a majority of not less than two-thirds of the members of the committee.

Bar of suit in absence of notice.

14. (1) No suit shall be instituted against any market committee or any member, officer or servant thereof or any person acting under the direction of any such committee, member, officer or servant for anything done or purporting to be done under this Act, until the expiration of two months next after notice in writing, stating the cause of action, the name and place of abode of the intending plaintiff and the relief which he claims, has been, in the case of a committee, delivered or left at its office, and in the case of any such member, officer, servant or person as aforesaid, delivered to him or left at his office or usual place of abode, and the plaint shall contain a statement that such notice has been so delivered or left.

(2) Every such suit shall be dismissed unless it is instituted within six months from the date of the accrual of the alleged cause of action.

(3) Nothing in this section shall be deemed to apply to any suit instituted under section 54 of the Specific Relief Act, 1877.

Power to borrow.

15. (1) Every market committee may, with the previous sanction of the Local Government, raise the money required for carrying out the purposes of this Act on the security of any property vested in and belonging to such committee, and of any fees leviable by such committee under this Act.

(2) The conditions in which such money shall be raised and the time within which the same shall be repayable shall be subject to the previous sanction of the Local Government.

Supersession of market committee.

16. (1) If, in the opinion of the Local Government, a market committee is not competent to perform, or persistently makes default in the performance of, the duties imposed on it by or under this Act, or exceeds or abuses its powers, the Local Government may, after giving such committee an opportunity for explanation, by an order published in the *Central Provinces Gazette*, declare such committee to be incompetent, or in default, or to have exceeded or abused its powers, as the case may be, and may supersede it.

(2) When a market committee has been superseded, all members of the committee shall, as from the date of the order, vacate their offices as members.

(3) When a market committee has been superseded, all property and rights vested in it shall, subject to all charges and liabilities affecting the same, vest in Government.

Provided that, if no new committee is constituted for the cotton market under section 5, all property that shall remain after the satisfaction of all debts and liabilities of the superseded market committee shall vest in the local authority of the area in which the cotton market is situated for the purpose of any object of public utility in the said area.

No private market to be opened in or near places declared to be cotton markets.

17. Whenever the Local Government has, by a notification under section 4, declared any place to be a cotton market, no person shall, notwithstanding anything contained in any enactment for the time being in force, within the area of such cotton market or within a distance thereof, to be notified in the *Central Provinces Gazette* in this behalf in each case by the Local Government, set up, establish or continue or allow to be continued any other market for the purpose of the purchase and sale of cotton.

Explanation.—A person shall not be deemed to set up, establish or continue or allow to be continued a place as a market for the purpose of the purchase and sale of cotton if he sells his own cotton outside the premises set apart by the market committee for the purpose of purchase and sale of cotton.

Penalties.

18. Whoever, in contravention of this Act, sets up, establishes, continues or allows to be continued any market for the purpose of the purchase and sale of cotton shall be punished, on conviction by a competent magistrate, with fine, which may extend to five hundred rupees, and in case of a continuing breach of the provision of section 17, with fine which may extend to one hundred rupees for each day after the first during which the breach continues.

Offences to be triable only by first class magistrate.

19. No offence under this Act or under any rule or bye-law made thereunder shall be triable by a magistrate other than a magistrate of the first class.

Disposal of fines, and institution of prosecutions.

20. All fines and damages recovered from an offender shall be paid to the market committee. Prosecutions under this Act may be instituted by any person duly authorized in writing by the market committee in this behalf.

APPENDIX VIII.

MADRAS COTTON CONTROL ACT, 1932.

A Bill to provide for the prohibition of the cultivation of pulichai cotton and the mixing of such cotton with other cotton and for the prohibition or restriction of the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

WHEREAS it is expedient in the best interests of the growers of cotton in certain areas in the Presidency of Madras, the cotton trade and the economic prosperity of the said Presidency, to maintain the quality and reputation of the cotton grown in those areas and for that purpose to prohibit the cultivation of pulichai cotton and the mixing of such cotton with other cotton and to prohibit or restrict the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

AND WHEREAS the previous sanction of the Governor-General has been obtained to the passing of this Act :

It is hereby enacted as follows :—

Short title and extent.

1. (1) This Act may be called the Madras Cotton Control Act, 1932.

(2) It extends to the whole of the Presidency of Madras.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context :—

(*a*) " cotton " means cotton plant, ginned and unginned cotton, cotton waste and cotton seed ;

(*b*) " notified area " means an area specified in a notification under section 3 ; and

(*c*) " pulichai cotton " means the kind of cotton known as G. neglectum var. roseum.

Power of Local Government to issue notification prohibiting the cultivation, etc., of pulichai cotton.

3. The Local Government may, by notification in the *Fort St. George Gazette*, in such local area and for such period as may be specified in the notification :—

(*a*) prohibit the cultivation of pulichai cotton ; or

(*b*) prohibit the mixing of pulichai cotton with any other kind of cotton ; or

(*c*) prohibit or restrict the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

Penalties.

4. Whoever, in contravention of any notification under section 3 :—

(*a*) cultivates pulichai cotton, or

(*b*) mixes pulichai cotton with any other kind of cotton, or

(*c*) possesses, uses or trades in pulichai cotton or any cotton mixed with pulichai cotton shall be punishable with fine which may extend to twenty rupees, and upon any subsequent conviction with fine which may extend to fifty rupees.

Power of entry and seizure.

5. (1) Any officer authorized in this behalf by the Local Government may, between the hours of 6 a.m. and 6 p.m. :—

(*a*) enter upon any land in a notified area in which he knows or suspects that pulichai cotton is being cultivated in contravention of a notification under section 3, uproot or cause to be uprooted such cotton, and seize the cotton so uprooted ; and

(*b*) enter upon or into any land, building, vessel or place in a notified area in which he knows or suspects that pulichai cotton or any cotton mixed with pulichai cotton is kept in contravention of a notification under section 3, and seize such cotton.

(2) Every officer seizing any cotton under this section shall forthwith :—

(*a*) make a report of such seizure to the Magistrate having jurisdiction to try the offence committed in respect of such cotton, together with particulars of such cotton and furnish a copy of such particulars to the occupier of the land, building, vessel or place on or in which such seizure was made, and

(*b*) subject to such rules as the Local Government may prescribe forward such cotton to the nearest officer authorized by the Local Government to receive it, for examination and report to the Director of Agriculture, Madras.

(3) The opinion of the authorized officer referred to in clause (*b*) of sub-section (2), contained in any document signed by such officer regarding the cotton sent to him for examination under that clause, may be used as evidence as to the nature of such cotton, in any inquiry, trial or proceeding under this Act.

Duty of owner and occupier to give facilities for inspection by authorized officer.

6. (1) Every owner or occupier of any land, building, vessel or place shall give all reasonable facilities to any officer authorized under sub-section (1) of section 5 to inspect such land, building, vessel or place.

(2) Whoever commits a breach of the provisions of sub-section (1) shall be punishable with fine which may extend to twenty rupees.

Previous sanction and limitation for prosecution.

7. No prosecution for an offence made punishable by this Act or any rule made thereunder shall be instituted :—

(*i*) without the previous sanction of the Director of Agriculture, Madras, or
(*ii*) after six months from the date of the commission of the offence.

Trial of offences.

8. No offence made punishable by this Act or any rule made thereunder shall be inquired into or tried by any Court inferior to that of a Presidency Magistrate or a Magistrate of the second class.

Indemnity.

9. No suit, prosecution or other legal proceeding whatever shall be entertained in any Court against any person for anything in good faith done or intended to be done in pursuance or execution of this Act.

Power of Local Government to make rules.

10. (1) The Local Government may, by notification in the *Fort St. George Gazette*, make rules consistent with this Act to carry into effect the purposes thereof.

(2) In making any rule, the Local Government may provide that a breach thereof shall be punishable with fine which may extend to twenty rupees.

NOTIFICATIONS AND RULES UNDER THE MADRAS COTTON CONTROL ACT.

GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT.

G. O. No. 939, 12*th July* 1932.

NOTIFICATIONS.

I

In exercise of the powers conferred by section 3 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to prohibit in the districts of Madura, Ramnad, Tinnevelly and Coimbatore, for a period of three years :—

(*a*) the cultivation of pulichai cotton ;

(*b*) the mixing of pulichai cotton with any other kind of cotton ; and

(*c*) the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

II

In exercise of the powers conferred by sub-section (1) of section 5 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to authorize all Deputy Directors of Agriculture and District Agricultural Officers, having jurisdiction over any notified area to exercise the powers specified in that section, within such area.

III

In exercise of the powers conferred by clause (*b*) of sub-section (2) of section 5 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to authorize the Cotton Specialist, Coimbatore, to receive cotton seized under sub-section (1) of that section for examination and report to the Director of Agriculture, Madras.

IV

Rules under section 10 (1) *of the Madras Cotton Control Act,* 1932 (*Madras Act VII of* 1932).

In exercise of the powers conferred by sub-section (1) of section 10 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to make the following rules to carry into effect the purposes of the said Act :—

1. The report required to be made under clause (*a*) of sub-section (2) of section 5 of the Act shall be in Form A or Form B annexed to these rules, according as the cotton to which the report relates was seized under clause (*a*) or (*b*) of sub-section (1) of section 5.

2. Every officer seizing any cotton under sub-section (1) of section 5 shall forward to the officer referred to in clause (*b*) of sub-section (2) of that section :—

(*a*) if the cotton seized weighs more than ten lbs. a sample of such cotton weighing ten lbs. and

(*b*) if the cotton seized weighs less than ten lbs. all the cotton seized.

FORM A.

Report of the seizure of cotton under clause (a) of sub-section (1) of section 5 of the Act.

1. Description of the land in which the pulichai cotton was cultivated :—

   (a) District.
   (b) Taluk.
   (c) Village.
   (d) (i) Survey number and
   (ii) Sub-division number, if any.

2. Name of the owner or occupier of the land.

3. Particulars of the cotton seized :—

   (a) Description.
   (b) Quantity.

4. Any other remarks.

Signature of the Reporting Officer.

Station.

Date.

FORM B.

Report of the seizure of cotton under clause (b) of sub-section (1) of section 5 of the Act.

1. Description of the land, building, vessel or place in which the pulichai cotton or cotton mixed with pulichai cotton was kept :—

   (a) District.
   (b) Taluk.
   (c) Village.
   (d) (i) Survey number and
   (ii) Sub-division number, if any.

2. Name of the owner or occupier of the land, building, vessel or place.

3. Name of the person from whose possession the cotton was seized.

4. Particulars of the cotton seized :—

   (a) Description.
   (b) Quantity.

5. Any other remarks.

Signature of the Reporting Officer.

Station.

Date.

APPENDIX IX.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract.*—The policy of growing 1027 *A.L.F.* in the Surat-Broach Tract lying south of the river Narmada was continued and 734,465 lbs. of seed were distributed to cultivators by opening 20 depots financed from the subsidy granted by the Indian Central Cotton Committee, Bombay, for the purpose. Besides, 1,572,060 lbs. improved 1027 *A.L.F.* seed was supplied to Rajpipla, Chhota-Udepur, Jambughoda and other States and the areas in these territories may safely be said to have been rehabilitated.

(2) *The Kumpta-Dharwar Tract.*—The work of introducing two improved varieties of cotton, viz., *Jayawant* (*Dharwar No.* 1 x *Dharwar No.* 2) and *Upland* (*Gadag No.* 1) was carried out on an extensive scale through the Cotton Sale Societies, Hubli and Gadag, with the aid of funds subsidised by the Indian Central Cotton Committee as outlined in the previous report. For multiplying pure pedigree seed of these two varieties, blocks of reserved areas were organised as usual. The reserved area under *Jayawant* cotton in Hubli centre was 17,640 acres and that under *Gadag No.* 1 in Gadag centre 22,514 acres against 17,057 acres and 23,638 acres respectively last year. The cotton crop was below normal owing to adverse climatic conditions. The quantities of seed cotton received by the Hubli and Gadag Sale Societies from these reserved areas were 5,565 *dokras* (1,869,840 lbs.) of *Jayawant* and 5,178 *dokras* (1,739,808 lbs.) of *Gadag No.* 1 and seeds produced therefrom were 1,060,000 lbs. and 1,200,000 lbs. to cover 106,000 acres and 120,000 acres respectively during the coming season.

With a view to spread *Jayawant* cotton all over the Dharwar-Kumpta area, separate seed multiplication blocks of 4,532 acres at Haveri, 1,851 acres at Bailhongal and 1,604 acres at Athani were organised and the seed obtained has been kept for general distribution. A separate seed multiplication scheme for Athani centre has been sanctioned by the Indian Central Cotton Committee during the year and seed sufficient for a reserved area of 1,100 acres has been purchased. An area of 20 acres was taken on lease and added to Dharwar Farm for multiplication of selfed seed in the second generation.

The quantity of *Jayawant* cotton continued to be good whereas that of *Upland* cotton was affected to a certain extent due to unfavourable weather conditions during the year.

Jayawant continued to be appreciated by the buyers ; but *Gadag No.* 1 cotton produced inferior staple owing to adverse climatic conditions and was less appreciated by the buyers. The buyers gave on an average Rs. 7 more per *Naga* of seed cotton (1,344 lbs.) for *Jayawant* and Rs. 15 per *Naga* more for *Gadag No.* 1 in auction sales held at Hubli and Gadag respectively over the local cotton against Rs. 13 and Rs. 25 per *Naga* of last year.

(3) *The Khandesh Tract.—Banilla* cotton continued to be popular in Khandesh. The total area under *Banilla* during 1931-32 is estimated at 125,009 acres grown from seed distributed by the Agricultural Department or preserved by the cultivators or sold by local gin-owners and other seed dealers. The total outturn was only about 10,000 bales giving an average yield of 32 lbs. of lint per acre. The ginning percentage was maintained and was 38 to 40 per cent. But the quality of cotton was rather damaged having yellow stain, and admixture of leaf and weak staple. *Banilla* cotton grown from seed distributed by the Department fetched on an average a premium of Rs. 20 per *candy* over local cotton and Rs. 25 per *candy* over *Oomra.*

With a view to supply genuine seed of *Banilla* to cultivators a five-year scheme has now been launched with the funds provided by the Indian Central Cotton Committee. During 1931-32 the "Reserved Area" was 2,780 acres. Owing to unfavourable season only 136,500 lbs. of seed were obtained from this area.

MADRAS.—I. *The Southerns Tract.*—(*a*) *Cambodia—Coimbatore.—General.*—The multiplication of the improved varieties of *Cambodia* cotton began in 1918-19. There are six limited liability co-operative seed societies of cotton growers at present,

against 15 in the previous year. Of these three in the Avanashi taluk, with an area of 871 acres, are under the control of the Co-operative Department against eight with an area of 850 acres in the previous year. The rest are under the supervision of the Agricultural Department. Under annual contracts, the Agricultural Department has been supplying improved seed to cultivators and advancing Rs. 5 to Rs. 7 per acre towards cultivation expenses. The cultivators sow the seed supplied by the Department on "Seed Farms" and the operation is supervised by the Department. The lint from the seed farm *kapas* is sold by the Department in public auction on behalf of the *ryots* at a premium and the seed is bought by the Department at a premium of Rs. 2 per *pothi* of 260 lbs. The seed is put up in bags of 25, 50 and 100 lbs. which are sealed with a lead seal inscribed $\frac{M}{A\ D}$ as a precaution against mixing of departmental seed with *bazar* grades. The seed is distributed among cultivators for extending the improved varieties. With the increased expansion of the seed farms, it is hoped that greater quantity of good seed will be made available for cultivators and that eventually high quality of lint will become a common feature of the country.

(*i*) The number of seed societies for *Co.* 2 cotton under the control of the Agricultural Department at the Tiruppur centre was three with an area of 727 acres against seven with an area of 718 acres in 1930-31. The Department also organised seed farms for 275 acres in the Annur area in the Avanashi taluk against 240 acres in the previous year. Thus, the total area under seed farms was 1,002 acres against 958 acres in the previous year.

292,250 lbs. of improved seed sufficient for sowing 14,600 acres were distributed in 1931-32 among the growers of cotton in the district of Coimbatore for further production against 212,701 lbs. in the previous year.

28,290 lbs. of seed were transferred to other districts in the Presidency and 2,225 lbs. were transferred outside the Presidency.

(*ii*) 345 *candies* of *Cambodia* lint were sold in a declining market on behalf of the seed farm *ryots* at a premium of Rs. 10 per *candy* of 500 lbs. against Rs. 20 to Rs. 30 in the previous year.

(*iii*) *The Tiruppur Loan and Sale Society* distributed 76,000 lbs. of seed sufficient for sowing 3,800 acres.

(*iv*) *Co-operative ginning.*—A few *ryots* in the taluks of Pollachi and Gobichettipalayam ginned their *kapas* with departmental assistance and sold 79,150 lbs. of good seed for sowing about 4,000 acres in the district against 164,000 lbs. in the previous year.

Cambodia—Trichinopoly.—In the Trichinopoly district also, *ryots* used 7,050 lbs. of *Co.* 2 *Cambodia* seed against 6,092 lbs. in the previous year.

Cambodia—Madura.—The area under seed farms (*Co.* 2) was 137 acres against 115 acres in the previous year.

(*b*) *Karunganni—Coimbatore.—Karunganni* cotton is making headway in the dry lands of the district of Coimbatore and is displacing dry *Cambodia* and *Uppam.* This strain is being propagated also in seed farm areas under contract with selected *ryots* as in the case of *Cambodia.* 122,577 lbs. of *Karunganni* seed mostly purchased from the seed farms of 1930-31 were distributed among cultivators for sowing in the district of Coimbatore against 99,875 lbs. in the previous year. The area under the improved strains will be about 8,200 acres against 5,000 acres in the previous year.

The area under seed farms in 1931-32 amounted to 791 acres against 750 acres in the previous year.

Karunganni—South.—The multiplication of the seed *C*-7 and *A*-10 on seed farms and production and sale of lint to agencies like Seed Unions and Co-operative Societies were

continued without the intervention of the Agricultural Department. The area under seed farms fell from 955 acres to 707 acres (350 acres under *A*-10 and 357 acres under *C*-7) in the year under review. The fall in area is due to the fact that *Karunganni* cotton has not found favour with the *ryots* owing to a succession of bad seasons and consequential low yields. An advance of Rs. 5 per acre was given as usual to the seed farm *ryots* for cultivation expenses.

63,833 lbs. of seed obtained from the seed farms of 1930-31 were sold to *ryots* for sowing about 6,380 acres against 115,195 lbs. in the previous year. Departmental strains in varying degrees of purity are now universal throughout the south and pure *Uppam* seeds formerly sown in the Ramnad District are used only in mixtures with *Karunganni*.

II. *Northerns and Westerns Tract.*—(*A*) *Northerns.*—*N*-14 is the improved strain for the locality though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. It was grown on 1,805 acres in the taluks of Nandyal and Koilkuntla under seed farm conditions against 1,728 acres in the previous year.

88,550 lbs. of *N*-14 seed, mostly obtained from the seed farms of 1930-31, were distributed for sowing against 91,916 lbs. in the previous year. The total area cultivated from seed distributed by the Department and *ryots* was 27,815 acres, i.e., 1,674 acres less than the area brought under cultivation in the previous year. The estimated yield of *kapas* was 150 lbs. per acre against 98 lbs. in the previous year. The Department assisted the seed farm *ryots* and other cultivators who grew the strain in ginning their *kapas* and selling the lint jointly. 145 bales of 500 lbs. each of lint were sold at a premium of Rs. 35 to Rs. 40 per bale against Rs. 59 in the previous year.

(*B*) *Westerns.*—*H*-1 strain evolved at the Hagari Agricultural Research Station in the Bellary District is spreading not only in the Westerns tract but also in parts of the taluks of Jammalmadugu and Proddatur in the Northerns tract. 240,104 lbs. of seed mostly obtained from the seed farms of 1930-31 were distributed for sowing in seed farms and *ryots*' fields. The area so sown was 24,861 acres against 22,500 acres in the previous year.

A large area of seed farms was being maintained in previous years, but the whole of the produce from the seed farm area was not purchased by the Department. Seed sufficient to cover the money advanced to the *ryots* for cultivation expenses was purchased for distribution in the following sowing season. But in the year under report, it was decided to purchase the whole of the produce from the seed farm area and to reduce the area suitably. The area under seed farms round about Guntakal in 1931-32 was thus only 2,748 acres against 6,407 acres in the previous year. The estimated yield of *kapas* was only 90 lbs. per acre against 100 to 120 lbs. in the previous year. The low yield was due to adverse season.

The Department assisted the *ryots* in ginning their *kapas* and selling the lint jointly. 234 bales of 400 lbs. each of lint were sold at a premium of Rs. 10 to Rs. 15 per bale against Rs. 14 to Rs. 25 in the previous year.

UNITED PROVINCES.—*A*. 19.—In the year under report the distribution of *A*. 19 cotton seed from Government stores was discontinued, as it was considered that this type was well established in and around Aligarh. The present policy is to encourage *C*. 520 in this tract but a good deal of demonstration is necessary before it can displace *A*. 19. So far it has been found suitable only to areas in which irrigation facilities are available. *C*. 402 was grown on a small scale; its extended growth, however, in this tract is a doubtful proposition. Canal water, an essential at the end of May and early June, if this cotton is to thrive, is somewhat uncertain. The year was not a good one for cotton and *C*. 402 suffered as much as others. The following amounts of *kapas* were dealt with through the Department :—

Western circle	198	*maunds*.
Central circle	1,995	,,
Sarda area	2,177	,,

The position of the two strains *C.* 402 and *C.* 520 evolved by the Botanical Section stands as follows :—

C. 402.—This is a strain which furnishes a quality of lint fit for spinning 16-20 counts and has been tested for its spinning capacity both by the Director, Technological Laboratory, Bombay, and the local mills at Cawnpore. *C.* 402 gives a high ginning percentage of 38 and this character makes it a valuable cotton for ginners and traders as well. As all long-staple cottons tend to be rather late in their maturation period, *C.* 402 requires to be sown early by means of artificial irrigation. Therefore it can only be taken up in canal irrigated tracts of the United Provinces. With the opening of the Sarda Canal a new tract comprising Unao, Hardoi and portions of Lucknow and Sitapur districts, where cotton can be grown, is being tried for its introduction. The cultivators have no experience of cotton cultivation with irrigation in these parts and attempts are being made by the Deputy Directors of Agriculture to explain the methods and advantages of cotton sowings with canal irrigation. In 1931-32 the Department of Agriculture distributed seed for about 1,490 acres. The Co-operative Department organised a Cotton Purchase and Sale Society which invested Rs. 14,445 for purchasing unginned cotton from the cotton growers, and after paying all charges for collection, cleaning, ginning and baling the Society gained a net profit of more than Rs. 5,000, the premium received being Rs. 1-9-0 per *maund* over *Bengals*.

C. 520.—This cotton was isolated as a result of a short survey of the botanical types conducted in the upper portions of the Gangetic Plain in Saharanpur and Bijnor districts in 1919 and 1920.

This is an early flowering, medium-stapled, high-ginning and high-yielding cotton which the average grower in the main cotton tract would like to take up without any consideration of staple and quality. This strain was not pushed forward in the irrigated areas as it was first evolved with a view to meet the demands of an improved strain in tracts, where facilities of irrigation do not exist and the cotton area is sown on the break of the monsoon only. But no arrangement for regular trials in rain-fed areas with this cotton has yet been possible.

The Punjab.—The total area under *American* was reported in the final cotton forecast to be 762,600 acres as compared with 836,100 acres in the preceding year. Of this 4-*F* was grown on 674,861 acres.

285-*F*—a later selection—was reported to have been grown on 85 acres, whilst 289-*F* —the other later selection—was reported to have been grown on 28,099 acres.

In the Final Cotton Forecast an area of 1,397,700 acres was reported under *desi* cottons against 1,329,200 acres during the preceding year. *Mollisoni*—a selection of the *Indicum* variety—was grown on 539,989 acres whilst a type of improved *Roseum* was grown on 71,707 acres.

At Lyallpur work continued on the selection of types of both *American* and *desi* cottons with a view to produce improved strains.

Central Provinces and Berar.—The area under *Verum* increased considerably during the year 1931-32 when 6,549 *khandies* of *Verum* seed were distributed throughout the province, which was sufficient to sow an area of approximately 261,600 acres. The season, however, was very bad for cottons in general, by reason of an abnormal and protracted rainfall which extended practically up to the middle of November, and a fine, promising crop was reduced to a wretched one, giving a very poor outturn. The premium obtained for the lint of *Verum*, however, was very satisfactory. Owing to the pool organisation in the province, the average price obtained by the cultivators for *Verum* lint was 36 per cent. above *Oomras* and 12 per cent. above *Broach* in 1931, while in 1932 (between 25th November 1931 and 21st March 1932) *Verum* fetched Rs. 269-2-0 per *candy* of 784 lbs. (2 bales) F.O.R. Bombay, i.e., 31 per cent. above *Oomras* and 28.5 per cent. above *Broach* which was then selling at Rs. 209-6-0 (average). This price, however, was obtained in the local markets and it is interesting to note that, with the exception of a very small quantity,

exported by traders outside the province, practically the whole crop of *Verum* 262, in the Central Provinces and Berar, was absorbed by the local mills. There has grown a very considerable demand for the seed of this cotton in these provinces, particularly in tracts which are infested with *wilt*, and attempts are being made to obtain a larger supply of pure seed for distribution in the next season. The variety is however somewhat susceptible to unfavourable climatic conditions.

BURMA.—*Myingyan Circle.*—The improved *Pwinbyu* strain of white flowered cotton was multiplied on 4,500 acres. Owing to the failure of the early rains the crop did badly and in some centres failed altogether.

The re-selected *C.* 19 strain which was multiplied on the Central Farm at Mahlaing, and on 687 acres cultivated by private growers, gave a ginning outturn of 42 per cent., which represents an improvement of 30 per cent. in the outturn of ginned cotton.

West Central Circle.—In the West Central Circle this crop is of importance only in Thayetmyo District where it is grown as a mixed crop with sesamum or with *taungà-ya* paddy. Its area there is just short of half a lakh acres.

Experimental work on cotton was continued on the Allanmyo Farm. Of the several crosses and pure lines kept under observation the Wagyi-Broach crosses, and four pure strains each of *Wagale* and *Wagyi* have been retained for further trials in 1932-33.

HYDERABAD STATE.—The Breeding work for the improvement of *Gaorani* cotton was continued on the Government Farm, Parbhani. Also a Botanical Survey of the cottons grown in the State is in progress.

Gaorani Tract.—The distribution of *Gaorani* seed was continued on more or less the same lines as in the previous seasons. About 1,680,000 lbs. of the best *Umri* seeds were purchased by the Department of Agriculture and given on *Takavi* loan system to the cultivators in the Protected Area. The area sown with the Departmental seed was about 1 lakh acres.

Aurangabad District.—The work of distributing *Banilla* cotton seed was continued to replace the mixture now grown in this district; 72,000 lbs. of *Banilla* seed were purchased from the Bombay Agricultural Department and were distributed in the villages of Jalna Taluka of Aurangabad District.

Raichur and Kopbal Districts.—*Kumpta* and *Dharwar.*—*American* of this area are hopelessly mixed. The work of replacing them with improved types was continued. About 200,000 lbs. of *Jayawant* and 50,000 lbs. of *Gadag No.* 1 seeds were purchased from the Hubli and Gadag Cotton Sale Societies respectively and were distributed on the *Takavi* system to the cotton growers in this area. In the case of *Jayawant* cotton, the reports received so far are encouraging and there is now a keen demand for the seed of *Jayawant.*

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, (2) by the Cotton Transport Act which prohibits and penalises the sowing or importing into the State for purposes of sowing of *Goghari* cotton seed or any other short-staple seed, and (3) by the control of ginning and pressing factories. The best seed of 1027 *A.L.F.* was, as usual, secured by deputing the experienced Thandar of Jhagadia with some leading cultivators of the State who purchased it with the assistance and guidance of the Cotton Superintendent, Surat. The seed thus obtained was distributed to the cultivators of the State from the different depots by way of *Takavi* and the outturn and the quality of cotton was all that could be desired.

Rajpipla cotton is now recognised as equal to the very best type of Surat cotton and is largely sought after.

For the next year too the State has, as usual, arranged to obtain the best seed of the improved strain of 1027 *A.L.F.* variety from Surat.

MYSORE STATE.—The cotton crop during the year was 66,303 acres as against 82,624 acres of the previous year.

The most important crop was *Sannahatti* (*G. herbaceum*) or *Kumpta* grown in large areas in Chitaldrug and Shimoga Districts, covering an area of nearly 61,000 acres. The staple measures about $\frac{7}{8}$″ with a ginning outturn of 25 per cent. Selection 69 occupies more than 20,000 acres in this tract and it gives a ginning outturn of 29 per cent. The lint is very much appreciated in the cotton market at Hubli.

In the South-eastern part of the State in Mysore District about 2,400 acres of *Nadam* (*G. obtusifolium*) cotton is grown in four of the taluks, where cotton soil prevails. By hybridizing *G. arboreum* and *G. herbaceum*, a strain of cotton has been evolved which has a staple of full 1″ with a ginning outturn of 29 per cent. This strain is being tested and multiplied on a large scale.

Round about Banavar and adjoining tracts about 3,000 acres of *Dharwar-American* cotton, locally called *Doddahatti* (*G. hirsutum*) is grown. It is said to have a reputation in the Bombay market. The plant is highly susceptible to leaf blight. Improvements by selection within the variety as well as by hybridization with American cottons have yielded some very valuable strains which possess good staple and high percentage of lint. They are being tested in several places during the year both for yield and quality.

APPENDIX X.

BALANCE SHEET AS AT MARCH 31st, 1932.

Receipts.	Rs. a. p.	Rs. a. p.	Expenditure and Investments.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		80,28,627 15 9	I.A. Administration		11,95,707 3 6
			B. Improvement of Cotton Marketing ..		73,244 1 1
			C. Seed Distribution and Extension Schemes:		
Interest Account—			(1) Bombay :—		
Amount received on investments	10,50,348 6 7		(i) Hubli	13,330 6 0	
			(ii) Gadag	21,075 13 9	
Add :—Refund of Income-tax deducted on interest	15,215 9 0		(iii) Khandesh	23,250 4 0	
			(iv) Surat	13,377 1 6	
	10,65,563 15 7		(2) Madras	3,060 0 0	
			(3) Lyallpur Ginnery	18,125 0 0	
Less :—Interest paid in advance at the time of purchasing Government Paper (since recovered) and Bank's commission for collection of interest.	40,382 12 9		(4) Sind	24,880 2 0	
			(5) Hyderabad	8,065 14 3	
			(6) Central Provinces	43,416 2 6	
					1,68,580 12 0
Income-tax deducted on interest	17,640 2 6		D. Printing and Propaganda		9,536 0 0
			II. *Technological Research.*		
Interest credited to Provident Fund Account ..	4,886 6 2		(1) Technological Laboratory :—		
			A. Capital Expenditure.		
Bank's withdrawal charges for securities sold ..	1,690 8 0		(i) Lands and Buildings	3,55,797 9 11	
			(ii) Machinery	83,977 6 1	
Provision for sinking fund	2,675 9 0		(iii) Freight	7,502 2 8	
			(iv) Apparatus and Equipment ..	41,558 3 7	
	67,275 6 5	9,98,288 9 2	(v) Machinery Workshop	5,789 8 3	
			B. Working Expenses	10,63,658 5 10	
Profit on conversion of 6% Tax free Bonds into 5% Taxable loan		5,000 0 0	(2) Provincial	27,350 8 9	
					15,85,633 13 1
Sinking Fund Account		2,675 9 0	III. Research Studentships		1,94,742 10 9
			Agricultural Research Grants.		
Miscellaneous Receipts		14,712 15 5	IV. Bombay—		
Refund from Provident Fund account for contributions disallowed to subscribers resigned ..		3,046 9 5	(a) Surat Physiological	2,25,077 13 9	
			(b) (i) Surat Bollworm	1,14,509 9 7	
Suspense receipts		9 3 0	(ii) Surat Bollworm Propaganda	29,000 12 0	
			(c) Dharwar Wilt	1,79,931 5 7	
			(d) Khandesh	26,384 6 0	
			(e) Co-ordination of cotton research	314 4 0	
Carried over ..		90,52,360 13 9	Carried over ..	5,75,218 2 11	32,27,444 8 5

BALANCE SHEET AS AT MARCH 31ST, 1932—*contd.*

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.	Rs. a. p.
Brought forward ..		90,52,360 13 9	Brought forward .	5,75,218 2 11	32,27,444 8 5
			V. Madras :—		
			(a) Herbaceum	85,516 4 5	
			(b) Pempheres and Physiological ..	15,209 10 10	
			(c) Fodder Cholam	3,019 10 0	
			VI. Punjab :—		
			(1) Botanical	3,52,494 6 5	
			(2) Entomological	95,772 14 1	
			(3) White Fly	8,728 10 0	
			VII. Central Provinces	2,44,194 12 1	
			VIII. United Provinces	1,33,060 9 3	
			IX. Institute of Plant Industry, Indore ..	10,29,676 12 0	
			X. Sind	1,09,044 7 1	
			XI. Burma :—		
			(a) Capital	2,906 15 5	
			(b) Cotton Improvement	4,074 12 0	
			XII. Hyderabad :—		
			(1) Botanical	66,625 10 2	
			(2) Cotton Survey	3,591 11 0	
			XIII. Bikaner	19,881 0 0	
			XIV. Baroda—Root Rot	3,212 0 0	
					27,52,228 3 8
			XV. Loans recoverable (but considered doubtful)		12,805 0 0
			Suspense account		63 11 2
			By Balance		30,59,819 6 6
Grand Total ..		90,52,360 13 9	Grand Total ..		90,52,360 13 9

BALANCE SHEET AS AT MARCH 31ST, 1932.

Provident Fund Account.

RECEIPTS.	—	—	INVESTMENTS.	Face Value.	Cost.
	Rs. a. p.	Rs. a. p.		Rs.	Rs. a. p.
Subscribers' Contributions ..	95,990 7 3		3½% G. P. Notes	85,600	59,754 3 1
Less—Refunds to Subscribers ..	28,964 7 2	67,026 0 1	5% 1939-44 Taxable Loan ..	25,600	24,606 15 6
Committee's Contributions ..	93,753 9 0		6% 1933-36 Taxable Loan ..	29,900	30,025 2 0
Less—Payments to Subscribers resigned	27,103 6 6		4% 1934-37 Taxable Loan ..	2,000	1,795 0 0
		66,650 2 6			
Recoveries against Advances ..		15,498 10 0	Balance in Current Account with the Imperial Bank of India, Bombay		14,423 2 1
Suspense deposit of Mr. Dutt's Contributions		882 9 7			
Total ..		1,50,057 6 2			
DEDUCTIONS.					
(1) Advances made	17,734 7 0				
(2) Accrued Interest credited to Subscribers on 31st March 1932	1,718 8 6	19,452 15 6			
Grand Total ..		1,30,604 6 8	Grand Total	....	1,30,604 6 8

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED MARCH 31ST, 1932.

RECEIPTS.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
* Opening Balance	31,33,756 3 8	Administration of the Committee (including Improvement of Cotton Marketing, Seed Distribution and Extension and Printing and Propaganda)		2,71,409 5 9
Receipts under Section 12 of the Indian Cotton Cess Act, 1923..	5,65,792 13 1	Agricultural Research Grants-in-Aid		3,75,333 9 3
† Other Receipts	8,409 14 5	Technological Research		1,53,130 8 0
Interest on Investments	1,64,602 9 6	*Closing Balance.*		
		(Government Paper at Cost.)		
			Face Value.	
		3½% Government Promissory Notes	Rs. 7,56,300	5,39,864 6 5
		5% Ten-Year Bonds 1935	„ 2,75,000	2,40,032 13 0
		5% Indian War Loan 1929-47	„ 7,88,000	7,65,220 12 10
		4½% Government of India Loan 1955-60	„ 26,600	25,004 0 0
		5% Government of India Loan 1939-44	„ 3,09,000	2,96,679 13 6
		6% Government of India Loan 1933-36	„ 1,16,900	1,16,930 0 0
		‡6% Bombay Municipal Debentures 1954	„ 50,000	56,500 0 0
		6% Rangoon Municipal Coupon Debentures 1955 ..	„ 3,83,500	4,15,328 2 0
		6% Karachi Port Trust Coupon Debentures 1956 ..	„ 1,30,000	1,41,212 8 0
		4½% India Sterling Stock 1950-55 Bearer	£ 16,000	1,95,621 14 4
		4½% India Sterling Stock 1958-68 Bearer	„ 8,000	93,762 12 6
		3½% India Sterling Loan 1931 Bearer	£ 16,000	1,28,579 12 8
		(Market Value on 31st March 1932, Rs. 27,99,712-10-0.)		30,14,736 15 3
		3 Months Government Treasury Bills	Rs. 25,000	24,656 4 0
		Call Deposit (with approved Banks)	..	13,000 0 0
		Imperial Bank of India, Ltd., Current Account	..	4,922 3 3
		Imprest—Committee's Account as certified by the Secretary ..	Rs. 1,504	
		Technological Laboratory as certified by the Director	„ 500	
		Cotton Research Botanist's Office, Punjab, as certified by the Cotton Research Botanist, Punjab ..	„ 500	
				2,504 0 0
		Suspense (Recoverable)		63 11 2
		Loans Recoverable (but considered doubtful)		12,805 0 0
		§ Total Closing Balance		.... 30,72,688 1 8
Total ..	38,72,561 8 8	Total	....	38,72,561 8 8

* Includes Rs. 1,735-7-0 on account of Sinking Fund and Rs. 12,805 against Loans recoverable from Hubli and Gadag.
† Includes Rs. 940-2-0 against Provision for Sinking Fund for the year 1931-32 and Rs. 3,046-9-5 being Committee's Contributions disallowed to Subscribers.
‡ Deposited with the Imperial Bank of India, Ltd., for Security against any Overdraft that may be required by the Committee.
§ This amount includes Rs. 2,675-9-0 on account of Provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required, and certify that to the best of our information and explanations received, the above Statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

Bombay, 6th April 1932.

(Sd.) S. B. BILLIMORIA & Co.,
Auditors.

PROVIDENT FUND ACCOUNT AS ON MARCH 31ST, 1932.

		Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1931		1,34,415 5 0	
Less :—Refunds to the Director of Agriculture, Bombay, for Excess Receipt		5 13 0	
		1,34,409 8 0	
Subscribers' Contributions ..	Rs. 19,492 2 0		
Add :—Recoveries against Advances	„ 6,712 7 0	26,204 9 0	
		1,60,614 1 0	
Less :—Refunds to Subscribers	„ 25,190 8 9		
Amount transferred to Suspense Deposit (Mr. Dutt's contributions) ..	„ 864 9 7		
Advances to subscribers ..	„ 3,331 14 0	29,386 13 4	
		1,31,227 3 8	
Committee's contributions, received from Indian Central Cotton Committee at 100 per cent. ..		19,492 2 0	
		1,50,719 5 8	
Less :—Refunds to Subscribers who have resigned and Refunds to Indian Central Cotton Committee on account of Committee's Contributions disallowed to subscribers resigned		26,538 9 3	
			1,24,180 12 5
Interest received on Investments		6,868 1 2	
Interest received on Advances to subscribers ..		129 0 4	
Refund of Income-tax deducted from interest received during 1930-31		95 11 0	
		7,092 12 6	
Less :—Interest paid during the year to subscribers who have resigned :—			
On their own contributions ..	Rs. 572 9 10		
On Committee's contributions	„ 553 5 8		
	„ 1,125 15 6		
Advance interest paid for Securities purchased (since recovered)	„ 139 4 9		
Income-tax deducted from interest on Govt. Paper (recoverable)	„ 76 0 7		
Bank's commission for collection of interest	„ 16 5 0		
Bank's withdrawal charges ..	„ 171 10 0		
Cost of Stationery	„ 22 8 0		
		1,551 11 10	
			5,541 0 8
Suspense Deposit :—			
(Mr. Dutt's own contributions with interest) ..		....	882 9 7
Total ..		....	1,30,604 6 8

		Face Value.	Rs. a. p.	Rs. a. p.
By Balance :—				
(Government Paper at cost).				
3½% Govt. Promissory Notes ..	Rs.	85,600	59,754 3 1	
5% Taxable Loan 1939-44 ..	„	25,600	24,606 15 6	
6% Govt. Bonds 1933-36	„	29,900	30,025 2 0	
4% Govt. Loan 1934-37	„	2,000	1,795 0 0	
			1,16,181 4 7	
(Market value on 31st March 1932 Rs. 1,07,198-0-0.)				
Balance in Current Account with the Imperial Bank of India Ltd.			14,423 2 1	
				1,30,604 6 8
Total ..			....	1,30,604 6 8

Examined and found correct,

Bombay, 6th April 1932.

(Sd.) S. B. BILLIMORIA & Co.
Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1932.

Major heads.	Total sanctioned grant.	Period. Yrs.	Mths.	Date of starting of work.	Total Expenditure up to 31st March 1932.	Expenditure from Capital Grant on (a) Lands and buildings.	Expenditure from Capital Grant on (b) Machinery and apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
	3			4	5	6	7	8	9	10
					RESEARCH SCHEMES.					
II. *Technological Research.*	Rs. a. p.				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(1) *Technological Laboratory.*										
(a) Capital Expenditure	5,04,799 3 8	Permanent		1923.	4,94,624 14 6	3,55,797 9 11	1,38,827 4 7	....	....	
(b) Working Expenses .	10,63,658 5 10	Permanent		Jan. 1924.	10,63,658 5 10	....	....	28,669 12 10	10,34,988 9 0	
(2) Provincial	27,350 8 9	Permanent		April 1928.	27,350 8 9	....	....	1,409 0 3	25,941 8 6	
AGRICULTURAL RESEARCH GRANTS:										
IV. *Bombay Schemes.*										
(1) Surat Physiological ..	2,91,445 0 0	9	11	Sept. 1923	2,25,077 13 9	....	....	15,911 15 6	2,09,165 14 3	*Closed down on 31-3-31.
(2) Surat Boll-worm* ..	1,20,720 0 0	7	7	Sept. 1923.	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	
(3) Surat Boll-worm Propaganda and Clean-up.	83,090 0 0	1	10	April 1931.	29,000 12 0	....	....	2,627 10 0	26,373 2 0	†Cotton Breeding Scheme closed down in July 1929
(4) Dharwar Wilt and Cotton Breeding† ..	2,63,545 0 0	8	9	Sept. 1923.	1,79,931 5 7	....	....	13,604 1 7	1,66,327 4 0	
(5) Khandesh Cotton Breeding‡	27,995 0 0	5	6	Oct. 1926.	26,384 6 0	....	....	....	26,384 6 0	‡Closed down on 31-3-32.
(6) Co-ordination of Cotton Research	23,991 0 0	....		Not started.	314 4 0	....	....	....	314 4 0	
V. *Madras Schemes.*										
(1) Herbaceum	1,07,460 0 0	10	6	Dec. 1923.	85,516 4 5	....	....	4,398 7 10	81,117 12 7	
(2) Pempheres and Physiological	66,000 0 0	2	4	Sept. 1931.	15,209 10 10	....	....	2,288 5 3	12,921 5 7	
(3) Fodder Cholam :—										
(a) Capital	900 0 0	....		Jan. 1931	3,019 10 0	....	881 11 7	....	....	
(b) Recurring	4,716 0 0	3	0		....	....	....	....	2,137 14 5	||Rs. 2,030 transferred to Capital from Working grant.
VI. *Punjab Schemes.*										
(1) Botanical :—										
(a) Capital Expenditure	||31,330 0 0	9	8	Aug. 1925.	3,52,494 6 5	22,158 0 0	9,102 11 0	....	....	
(b) Working Expenses .	||5,23,900 0 0				....	....	14,309 14 0	3,06,923 13 5	
(2) Entomological :—										
(a) Capital Expenditure	6,000 0 0	6	11	May 1926	95,772 14 1	....	5,826 3 10	....	....	
(b) Working Expenses .	1,22,000 0 0					....	....	6,755 11 0	83,190 15 3	
(3) White Fly	34,500 0 0	3	0	May 1931.	8,728 10 0	....	....	132 4 0	8,596 6 0	¶The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
VII. *Central Provinces*	¶61,000 0 0	2	6	Oct. 1923.	2,44,194 12 1	....	....	4,174 10 11	2,40,020 1 2	
	3 22,165 0 0	8	0	April 1926.						
VIII. *United Provinces*										
Pink Boll-worm Scheme :—										
(a) Capital Expenditure	54,000 0 0	8	0	Jul 1923.	1,33,060 9 3	....	47,758 10 6	....	82,236 10 6	
(b) Working Expenses .	56,000 0 0					....	....	3,065 4 3		
(c) Recurring grant for staff	39,775 0 0	7	0	Oct. 1926.		....	....	....		

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1932—*contd.*

Major heads.	Total sanctioned grant.	Period. Yrs. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1932.	Expenditure from Capital Grant on (a) Lands and buildings.	Expenditure from Capital Grant on (b) Machinery and apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1		3	4	5	6	7	8	9	10
AGRICULTURAL RESEARCH GRANTS—*contd.*									
IX. *Institute of Plant Industry, Indore.*	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(*a*) Capital Expenditure.	§2,83,536 11 9	Permanent.	Oct. 1924.	10,29,676 12 0	2,12,552 11 5	70,984 0 4	....	....	§Rs. 50,202-12-10 transferred from Recurring Grant to Capital.
(*b*) Working Expenses .	7,46,140 0 3				....	....	31,857 4 4	7,14,282 11 11	
X. *Sind*	2,74,346 0 0	9 9	July 1927.	1,09,044 7 1	....	....	10,187 1 11	98,857 5 2	
IX. *Burma.*		..	....						
(*a*) Capital Expenditure.	3,000 0 0			2,906 15 5	....	2,906 15 5	....	....	
(*b*) Cotton Improvement	19,224 0 0	3 0	April 1931.	4,074 12 0	....	....	1,046 0 0	3,028 12 0	
XII. *Hyderabad.*									
(*a*) Botanical	1,22,500 0 0	5 0	May 1929.	66,625 10 2	....	....	5,674 11 4	60,950 14 10	
(*b*) Cotton Survey ..	33,580 0 0	4 10	June 1931.	3,591 11 0	....	....	49 1 4	3,542 9 8	
XIII. *Bikaner.*									
(*a*) Capital Expenditure.	14,500 0 0	5 0	Jan. 1931.	19,881 0 0	8,520 10 9	3,759 0 0	....	....	
(*b*) Working Expenses .	38,200 0 0				....	....	....	7,601 5 3	
XIV. *Baroda.*—Root Rot	21,720 0 0	2 0	Feb. 1932.	3,212 0 0	....	....	....	3,212 0 0	
SEED EXTENSION SCHEMES.									
C. SEED DISTRIBUTION AND EXTENSION SCHEMES.									
1. Bombay.									
(*i*) Hubli	40,800 0 0	5 years.	June 1930.	13,330 6 0	....	....	....	13,330 6 0	
(*ii*) Gadag	44,875 0 0	5 years.	June 1930.	13,800 13 9	....	....	....	13,800 13 9	
(*iii*) Gadag Supplementary.	21,448 0 0	4 years.	June 1931.	7,275 0 0	....	....	2,957 4 3	4,317 11 9	
(*iv*) Haveri..	27,752 0 0	5 years.	....	....	....	....	....	....	Not yet started.
(*v*) Athani..	46,757 0 0	5 years.	....	....	....	....	....	....	Started in April 1932
(*vi*) Bailhongal	27,425 0 0	5 years.	....	....	....	....	....	....	Not yet started.
(*vii*) Surat	29,660 0 0	4 years.	April 1930.	13,377 0 0	....	....	....	13,377 0 0	
(*viii*) Khandesh	*2,70,340 0 0	5 years.	May 1931.	23,250 4 0	....	....	3,126 13 0	20,123 7 0	*Recoveries amounting to Rs. 1,10,000 are anticipated from this scheme which will reduce the actual cost from Rs. 2,70,340 to Rs. 1,60,340.
2. Madras	18,000 0 0	5 years.	Sept. 1931.	3,060 0 0	....	....	....	3,060 0 0	
3. Punjab-Lyallpur Ginnery .	18,125 0 0	....	....	18,125 0 0	†10,825 0 0	†7,300 0 0	....	....	†As per budget; details of actual expenditure awaited.
4. Sind	93,000 0 0	3 years.	April 1931.	24,880 0 0	....	....	1,242 4 9	23,637 11 3	
5. Hyderabad State	15,000 0 0	3 years.	March 1930.	8,065 14 3	....	....	....	8,065 14 3	
6. Central Provinces	92,975 8 0	About 3 years.	Sept. 1930.	43,416 2 6	....	....	....	43,416 2 6	

APPENDIX XI.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1.	Secretary	Mr. J. H. Ritchie, M.A., B.Sc., I.A.S. ..	On deputation from Central Provinces Department of Agriculture. (On leave.)
2.	Deputy Secretary	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S. ..	On deputation from Madras Department of Agriculture. (Offg. Secretary.)
3.	Publicity and Propaganda Officer ..	Mr. R. D. Mihra, M.A. Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), B.Litt., Rural Econ. (Oxon.).	—

TECHNOLOGICAL LABORATORY, BOMBAY.

4.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.) ..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
5.	Spinning Master	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
6.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
7.	Senior Research Assistant (Assistant Technologist).	Mr. D. F. Kapadia, B.Sc., Tech. (Manch.), B.A. (Bom.)	Research Scholar, Technological Laboratory (Textile Physics).
8.	Senior Research Assistant (Physicist)..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
9.	Senior Research Assistant (Physicist)..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Research Scholar, Technological Laboratory (Textile Physics).

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

10.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U. P.
11.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
12.	Statistician	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
13.	Temporary Research Assistant ..	Mr. R. N. Mathur, M.Sc. (Allahabad) ..	Research Scholar, University Laboratories, Allahabad and Lahore.
14.	Electrician	Mr. Herculano Lobo, L.E.E. (V. J. T. I.) ..	—
15.	Junior Tester	Mr. S. S. Sukhthankar, L.T.C. (V. J. T. I.) ..	—
16.	Junior Tester	Mr. K. G. Deo	—
17.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	—
18.	Junior Tester	Mr. K. S. Marar, B.A., LL.B.	—
19.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	—
20.	Junior Tester	Mr. G. D. Bhide, B.Sc.	—
21.	Junior Tester	Mr. K. V. N. Nayar	—
22.	Junior Tester	Mr. V. N. Modak, B.Sc.	—
23.	Junior Tester	Mr. L. V. Sundararaman, B.A.	—
24.	Junior Tester	Mr. P. S. Sambamurthi	—
25.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	—
26.	Junior Tester	Mr. Sassoon Samson, B.Sc.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

27.	Junior Tester	Mr. A. J. Farid	—
28.	Junior Tester	Mr. U. K. Benegal, B.A.	—
29.	Junior Tester	Mr. P. V. Nachane, B.Sc.	—
30.	Spinning Assistant	Mr. N. Iyengar	—
31.	Statistical Clerk	Mr. R. Krishna Iyer	—
32.	Statistical Clerk	Mr. P. K. Wagle	—

INSTITUTE OF PLANT INDUSTRY, INDORE.

33.	Director	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab).	Director of Research, Department of Agriculture, Iraq (1923-30).
34.	Extension Officer	Mr. Misri Lal Saksena, L.Ag. (Cawnpore)	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.
35.	Senior Farm Assistant	Mr. G. C. Tambe, B.Ag. (Bombay)	—
36.	Chief Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay)	Research Student, Indian Central Cotton Committee.
37.	Plant Breeding Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	—
38.	Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)	—
39.	Chemical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	—
40.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow)	—
41.	Junior Farm Assistant	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
42.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	—
43.	Junior Farm Assistant	Mr. G. G. Phadke, L.Ag. (Nagpur)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST 1932—*contd.*

BOMBAY RESEARCH SCHEMES.

	(i) *Physiological.*		
44.	Cotton Physiologist	Mr. K. V. Joshi, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
45.	Bio-Chemical Assistant	Mr. R. B. Gode, M.Sc.	—
46.	Junior Assistant	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
	(ii) *Mycological.*		
47.	Special Cotton Mycologist	Mr. G. S. Kulkarni, M.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
48.	Non-Graduate Assistant	Mr. V. G. Kulkarni	—
	(iii) *Entomological (Clean-up Scheme).*		
49.	Cotton Entomologist	Mr. B. P. Deshpande, M.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
50.	Junior Assistant	Mr. N. T. Nadkarni, B.Ag. (Bombay) ..	—
51.	Graduate Assistant	Mr. K. D. Naik, B.Ag. (Bombay)	—
52.	Graduate Assistant	Mr. M. S. Patel, B.Ag. (Bombay)	—
	(iv) *Broach Cotton Breeding Scheme.*		
53.	Cotton Breeder	Mr. G. B. Patel, B.Ag.	On deputation from Bombay Department of Agriculture.
54.	Botanical Graduate Assistant	Mr. P. L. Patel, M.Sc. (Iowa, U. S. A.) ..	—
55.	Pathological Graduate Assistant ..	Mr. Y. S. Kulkarni, B.Ag.	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(v) *Jalgaon Cotton Breeding Scheme.*

56.	Botanical Graduate Assistant	Mr. V. L. Bhosekar, B.Ag.	On deputation from Bombay Department of Agriculture.	
57.	Pathological Graduate Assistant ..	Mr. J. D. Ranadive, B.Ag.	Research Student, Indian Central Cotton Committee.	
58.	Non-Graduate Assistant	Mr. P. A. Rao	—	

BOMBAY SEED DISTRIBUTION SCHEMES.

(i) *Hubli and Gadag.*

59.	Graduate Assistant	Mr. B. S. Patil, B.Ag. (Bombay)	—	
60.	Graduate Assistant	Mr. B. M. Dhumma, B.Ag. (Bombay) ..	—	
61.	Manager, Seed Farm, Gadag	Mr. G. Y. Kurli	On deputation from Bombay Department of Agriculture.	

(ii) *Surat.*

62.	Cotton Assistant	Mr. V. D. Desai	On deputation from Bombay Department of Agriculture.	

(iii) *Khandesh (Banilla Scheme).*

Stage II.

63.	Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag.	On deputation from Bombay Department of Agriculture.	
64.	Non-Graduate Assistant	Mr. J. T. Bokil	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES—*contd.*

Stages III, IV and V.

65.	Cotton Superintendent, Jalgaon ..	Mr. S. V. Shevade, L.Ag.	On deputation from Bombay Department of Agriculture.
66.	Graduate Assistant	Mr. R. B. Nimbalkar, B.Ag.	Do. do.
		SIND PHYSIOLOGICAL RESEARCH SCHEME.	
67.	Cotton Physiologist, Sakrand ..	Mr. B. M. Dabral, M.Sc. (Benares)	—
68.	Senior Assistant	Vacant.	
69.	Junior Assistant	Mr. Rustom M. Ranji, Dip.Ag. (Bombay) ..	—
70.	Junior Assistant	Mr. R. G. Deshpande, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
		SIND SEED DISTRIBUTION SCHEME.	
71.	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
72.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. K. H. Advani, B.Ag. (Bombay), M.Sc. (Texas, U.S.A.).	On deputation from Bombay Department of Agriculture.
73.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. M. A. Memon, B.Ag. (Bombay)	—
74.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. R. N. Gidwani, B.Ag. (Bombay).. ..	Research Student, Indian Central Cotton Committee.
75.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj P. Tejwani	On deputation from Sind Department of Agriculture.
76.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani	—
77.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Partabsingh J. Bakshi	—
78.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Tahilram	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

79.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture. (On leave.)
80.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post Graduate, Pusa.	On deputation from Central Provinces Department of Agriculture. (Officiating Economic Botanist for Cotton.)
81.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
82.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.
83.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.
84.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do. do.
85.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	—

MADRAS RESEARCH SCHEMES.

(i) *Herbaceum.*

86.	Senior Assistant	Mr. R. Balasubramaniam, B.A., B.Sc. (Ag.) ..	On deputation from Madras Department of Agriculture.
87.	Assistant	Mr. G. Seshadri Ayyangar, M.A.	—
88.	Assistant	Mr. V. Ramaswami Mudaliar, B.A.	—
89.	Sub-Assistant	Mr. D. Devasirvatham, Government Tech. Examination in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

MADRAS RESEARCH SCHEMES—*contd.*

(ii) *Pempheres and Physiological.*

90.	Assistant Botanist	Mr. K. Dharmarajulu, B.Sc. (Bombay), M.Sc. (Bombay).	Research Student, Indian Centra Cotton Committee.	
91.	Assistant Chemist	Mr. M. Suryanarayana, B.Sc.(Calcutta) ..	On deputation from Madras Department of Agriculture.	
92.	Assistant Entomologist	Mr. E. R. Gopala Menon, B.A. (Hons.) (Madras).	Do.	do.

(iii) *Fodder Cholam.*

93.	Junior Assistant	Mr. S. Sundaram, B.A., B.Sc. (Agri.) ..	Do.	do.

MADRAS SEED DISTRIBUTION SCHEME.

94.	Business Manager, Tirupur Loan and Sale Society.	Mr. K. Avudainayakam Pillai, L.Ag. ..	Do.	do.

PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

95.	Acting Cotton Research Botanist ..	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee and State Research Scholar. On deputation from Punjab Department of Agriculture.
96.	Assistant to Cotton Research Botanist..	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.
97.	Technical Assistant	Bh. Sarup Singh, L.Ag.	Do. do.
98.	Junior Research Assistant	Mr. Akbar Ali, B.Sc. (Post Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

PUNJAB RESEARCH SCHEMES—(*contd.*)

(i) *Botanical*—contd.

99.	Technical Assistant	Mr. Ramesh Chandar, M.Sc. (Agri).	On deputation from Punjab Department of Agriculture .
100.	Technical Assistant	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Fazil.	Do. do.
101.	Assistant Physiologist and Microscopist.	S. Sant Singh Verma, M.Sc. (Benares) ..	Research Student, Indian Central Cotton Committee.
102.	Statistical Assistant	Mr. S. Subramonia Iyer, B.A. (Hons.), M.A. (Madras).	—

(ii) *Entomological.*

103.	Assistant Cotton Entomologist ..	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	—
104.	Field Assistant, Sialkot Research Work.	Mr. Ladha Ram, B.Sc.	—
105.	Field Assistant, Rohtak Research Work.	L. Ganda Ram, B.Sc., F.E.L.	—
106.	Field Assistant, Lyallpur Research Work.	Mr. Nazir Ahmad, M.Sc.	—
107.	Statistical Assistant	L. Sham Narain, B.Sc. (Agri.)	—

(iii) *White Fly.*

108.	Assistant Cotton Entomologist ..	L. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
109.	Field Assistant	Mr. Piare Mohan Verma, B.Sc. (Hons.) (Punjab), M.Sc.	Research Student, Indian Central Cotton Committee.
110.	Field Assistant	L. Prem Rattan Mahjor, M.Sc. (Agri.) ..	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*

		UNITED PROVINCES ENTOMOLOGICAL RESEARCH SCHEME.		
111.	Special Research Assistant	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab).	Research Student, Indian Central Cotton Committee.	
		HYDERABAD RESEARCH SCHEMES.		
		(i) *Botanical.*		
112.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab) .	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.	
113.	Assistant Cotton Research Botanist ..	Mr. D. V. Narayanyya, Dip. Agri. (Bombay) .	On deputation from Bombay Department of Agriculture.	
114.	Assistant Cotton Research Botanist ..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.	
		(ii) *Cotton Survey.*		
115.	Assistant Cotton Research Botanist ..	Mr. B. B. Mulchandani, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.	
		HYDERABAD SEED DISTRIBUTION SCHEME.		
116.	Inspector	Mr. M. V. Chitnis	—	
		BIKANER GANG CANAL RESEARCH SCHEME.		
117.	Assistant to Agricultural Officer, Bikaner State.	Mr. N. S. Apte, B.Ag. (Bombay)	—	
		BARODA RESEARCH SCHEMES.		
		(i) *Root Rot.*		
118.	Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.	
119.	Mycological Assistant	Mr. D. G. Limaye, B.Ag. (Bombay)	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*concld.*

BARODA RESEARCH SCHEMES—*contd.*

(i) *Root Rot*—contd.

120.	Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	—	

(ii) *Comparative Tests between* 1027 *and* 1*A Cottons.*

121.	Supervisor	Mr. Pragji Ranchhodji Desai, L.Ag. (Bombay).	—	

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

122.	Under Cotton Specialist, Coimbatore ..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.	
123.	Under Cotton Breeder, Dharwar ..	Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.	
124.	Under Cotton Research Botanist, Lyallpur.	Mr. K. R. Sen, M.Sc. (Dacca)	Research Student, Indian Central Cotton Committee.	
125.	Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Do.	do.

APPENDIX XII.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Acting Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces, Botanical Research Scheme.	Do.
,,	Jiwan Singh, M.Sc. (Punjab). .	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Bombay Agricultural Service, Cotton Breeder, Sind.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology .	Special Research Assistant, Pink Boll-worm Investigation, United Provinces.	Do.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University)	Surat	Cotton Physiology. .	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology .	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department, Junior Research Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology .	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
8 ,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Abroad for further study ..	Technological Assistant, Dharwar, up to 31st July 1929.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Graduate Assistant, Cotton Breeding, scheme, Khandesh.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
,,	L. N. Rao, M.Sc. (Calcutta)..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay), B.Sc. (Tech, Manchester).	Do. ..	Cotton Technology .	Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Do.

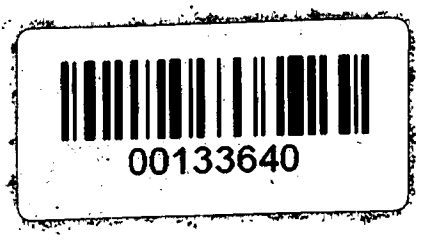
Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat..	Cotton Physiology. .	Bombay Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	....
7 ,,	Karam Singh Lamba, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology .	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., M.Sc. (Bombay).	Coimbatore.. ..	Cotton Bio-chemistry.	Chief Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Bombay Agricultural Department, Cotton Supervisor, Indus Right Bank Cotton Extension Scheme, Sind.	Do.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Junior Farm Assistant, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology	Technological Assistant, Coimbatore.	Do.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology .	Government scholar for study abroad.	Obtained Ph. D. (Cantab.)
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do. ..	Do. ..	Obtained Doctorate at Edinburgh.
9 ,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology. .	Unemployed	....

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1927	Sant Singh Varma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	Temporary Assistant Physiologist, Punjab Botanical Research Scheme.	Granted a Foreign Scholarship by the Indian Central Cotton Committee.
,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Unemployed	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology .	Field Assistant, White Fly Investigation, Punjab.	Do.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Senior Assistant to Cotton Supervisor, Indus Left Bank Cotton Extension Scheme, Sind.	Do.
,,	M. Kanti Raj, M.A., B.Sc. (Agri.), (University of Edinburgh).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Madras Agricultural Service, Personal Assistant to the Director of Agriculture, Madras.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
1929	Srinagabhushana, B.Sc. ..	Do. ..	Do. ..	Technological Assistant, Surat.	Do.
,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do.	Do. ..	Do. ..	....

LIST OF RESEARCH STUDENTS—*concld.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1930	Madan Lal Bhatia, M.Sc. (Punjab).	Lyallpur	Entomology.. ..	Research Student ..	Under-training.
,,	Bhola Nath, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Do.	
,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
,,	Brajandra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	Research Student	Under training.
1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Cotton Marketing and Economics.	....	Resigned.
,,	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	Research Student	Under training.
,,	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Do.	
,,	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do. ..	Do.	

"Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants.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